MICHIGAN WEATHERIZATION PROGRAM

WEATHERIZATION FIELD MANUAL

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INTRODUCTION AND OVERVIEW

The Weatherization Field Manual (WFM) contains policies, procedures, and requirements for the Michigan Weatherization Program. Community action agencies/local weatherization operators (CAAs/LWOs) receiving funding from the state of Michigan for local administration of the weatherization program shall follow the guidelines contained in the WFM relative to technical and program requirements.

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TECHNICAL REQUIREMENTS - INTRODUCTION

This chapter contains the technical weatherization policies, procedures, and requirements for the Michigan Weatherization Program, including measures guidelines/policies (which include "incidental repairs"), inspection/testing and energy audit requirements, standards and specifications for weatherization measures, mobile home weatherization requirements, health and safety requirements, and testing requirements (which include blower door testing, carbon monoxide testing, combustion appliance inspection/testing, and infrared scans).

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WEATHERIZATION MEASURES

Guidelines, policies, costs, standards and specifications for weatherization measures and related repairs are contained in this section, along with inspection, testing and energy audit requirements.

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A. GENERAL WEATHERIZATION MEASURES GUIDELINES/POLICIES/COSTS

All weatherization materials utilized in conjunction with work performed as a part of this program shall, at minimum, meet the Standards for Weatherization Materials contained in "Appendix A" as published in the current U.S. Department of Energy/Weatherization Assistance Program (DOE/WAP) rules (See Chapter III, Section IV.A.1., Minimum Standards for Wx Materials). In cases were additional requirements apply, the specific requirement(s) will be listed in the appropriate section of this document.

All work measures shall be completed so as to successfully perform the intended function on a continuing basis (a quality of product and installation to provide a minimum 10-year life under normal conditions). Work shall be completed in a manner so as not to detract from the general appearance and structural integrity of the home and shall be in compliance with governing codes, the requirements of this document, and manufacturer's recommendations.

Weatherization measures are for the purpose of rendering the heated portions of dwellings energy efficient and to ensure the safety and protection of such measures, whether new or existing (i.e., any wood or other product which the manufacturer recommends be sealed, that is used to complete weatherization and which is exposed to moisture, shall receive a minimum of prime painting or other recommended sealer). For the purpose of this program, if necessary client usage of areas requires heat to those areas, they should be treated as heated, and weatherized accordingly. Unheated utility rooms, porches, etc., are not eligible for weatherization.

Health and safety measures shall/may be addressed as required to eliminate hazards as defined in Section III of this Chapter.

“Incidental Repairs” means those repairs necessary for the effective performance or preservation of weatherization materials. Incidental repairs may be addressed as required (see CSPM 607).

COST LIMITS/AVERAGES

SUPPORT, LABOR AND MATERIAL AVERAGE:

LWOs shall comply with the DOE established average per unit cost for support, labor, and materials for the program year. Individual unit costs may exceed the average, but overall spending for the program year must fall within the average limit (see CSPM 613).

OPTIONAL LABOR AND MATERIAL COST LIMITS:

LWOs may, as a part of their weatherization contract, establish a labor and material (L&M) cost limit per home (see CSPM 304).

HEALTH AND SAFETY LABOR AND MATERIAL AVERAGE:

CSPM 614 establishes an average cost per unit for health and safety related repairs (see Section III of this Chapter for Health and Safety Guidelines).

INCIDENTAL REPAIR MATERIAL COST:

Incidental repair costs are included in the average cost per unit (see CSPM 607).

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B. INSPECTION/TESTING/ENERGY AUDIT REQUIREMENTS

INSPECTION/TESTING REQUIREMENTS

A complete pre-inspection and post-inspection is required for each home weatherized. Inspections shall include energy audit reviews as well as the required testing listed below. Post-inspection approval is mandatory for a home to be considered a completion. All inspections must be completed by a FIA certified Wx inspector or a trainee or conditionally certified inspector under the supervision of a certified inspector (see Chapter III. Section IV.B).

BLOWER DOOR TESTING:

All homes weatherized will require a pre and post blower door test (see Section IV.A of this Chapter and Chapter III. Section I).

COMBUSTION APPLIANCE INSPECTION/TESTING:

All homes weatherized will require pre and post combustion appliance inspection and testing (see Section IV.B and C of this Chapter).

HEALTH AND SAFETY INSPECTION/TESTING:

All homes weatherized will require health and safety inspection and testing (see Section III of this Chapter).

ENERGY AUDIT REQUIREMENTS

The “Michigan Weatherization Program Audit Requirements”chart on page 14 of this Subject shows the audit requirements based on dwelling characteristics.

NEAT WEATHERIZATION MEASURES PRIORITIES (FOR STANDARD WOOD FRAME HOMES):

For one to four unit homes of standard wood frame construction the following list of priorities may be used or a National Energy Audit Tool (NEAT) audit may be completed, at the agency's option.

Health and Safety Measures
Major Bypasses
Duct Sealing/Repair/Replacement
Duct Insulation (in unconditioned areas)
Attic Insulation (if under an effective R8, ***add*** additional **R19**)
Kneewall Insulation (R11)

Wall Insulation (R11 or R-value determined by wall thickness)
Infiltration/Exfiltration
Compact Fluorescent Light Bulbs
Bandjoist ("Sillbox") Insulation (R11/19 as applicable)
Floor Insulation (R11)
Perimeter Insulation (R10)
Attic Insulation (should be brought up to R30 if funding permits, regardless of amount of existing insulation - R38 if homes are heated by fuels other than natural gas)

The measures above should be completed in the order listed and according to the procedures outlined in Section I.C of this Chapter.

Notes: In addition, Refrigerator Replacement should be evaluated using NEAT or the D&R audit. In cases where, due to conditions/circumstances at a job site, a priority measure cannot be addressed (i.e., a bad roof precludes attic insulation), documentation of the conditions/circumstances shall be provided on the appropriate page of the BCJO and the measure shall not be addressed.

Exceptions: Homes in which none of the insulation measures are to be addressed (attic, kneewall, wall, floor, or perimeter) or which have an inoperable furnace/boiler must be evaluated/weatherized through a NEAT audit and the weatherization measures priorities cannot be utilized.

NATIONAL ENERGY AUDIT TOOL (NEAT) DETERMINED WEATHERIZATION MEASURES:

NEAT audits are required for the determination of weatherization measures to be installed for one to four unit homes in cases where:

- No insulation measures (attic, kneewall, wall, floor, or perimeter) are required/possible.
- Furnace/boiler/space heater with a steady state efficiency of less than "**70%**".
- Inoperable furnace/boiler/space heater.
- Homes are of non-standard construction.

Agencies may elect to utilize a NEAT audit for any one to four unit home with the exception of mobile homes.

Weatherization measures with a computed Savings to Investment Ratio (SIR) of 1.5 or greater established by a NEAT audit shall be addressed in descending order (from the highest SIR down to a minimum SIR of 1.5).

Note: In cases where NEAT may indicate that a measure should be addressed, but conditions/circumstances dictate otherwise (i.e., NEAT gives a high SIR for Foundation Insulation, but the foundation area seasonally floods), these measures should be turned off in the NEAT setup "Candidate Measure" screen and indicate the condition on the "General Info." screen at the beginning of the audit or by inserting a "zero" or in some cases "none" in the respective measure screen and adding a comment in the indicated "comment" section, documentation of the conditions/circumstances shall also be provided on the appropriate page of the BCJO, and the measure shall not be addressed.

MOBILE HOME AUDITS/WEATHERIZATION MEASURES:

Mobile homes measures allowed were determined utilizing the Department of Energy (DOE) Project Retro-Tech. Following is a list of mobile home measures so determined and approved by DOE:

1. General Heat Waste (infiltration/exfiltration measures, compact fluorescent light bulbs and water heater insulation).
2. Wall Insulation.
3. Attic Insulation (minimum R-19).
4. Floor Insulation (minimum R-11).
5. Storm Windows.
6. Refrigerator Replacement (to be evaluated using a NEAT Audit or the D&R International, LTD audit - see WFM II.I.D.2)

In addition, duct/pipe insulation shall be addressed for ducts (also correct leaks in all ducts regardless of location) and pipes located in unheated areas or areas which will be made unheated by insulating. Smoke detectors and venting for clothes dryers shall be provided as needed on mobile homes weatherized as health and safety measures.

Additional/optional weatherization measures (i.e., wall insulation, low flow shower heads, clock setback thermostat) and other necessary health and safety measures may be addressed on mobile homes at the agency's option. A consistent agency policy should be established as to whether additional measures will be addressed on mobile homes. Measures shall be completed in compliance with Section I.C of this Chapter.

MULTIFAMILY AUDITS(5 Units Or More)/WEATHERIZATION MEASURES:

A DOE-approved audit format (i.e., Residential Conservation Services [RCS] audit for multifamily buildings) appropriate to the type of building to be

weatherized, shall be utilized to determine the appropriate weatherization measures for buildings with five units or more. Such audits would generally be completed by a utility company or other entity using the DOE-approved audit format. Completed audits for buildings with five units or more shall be submitted to the state weatherization office for approval prior to the commencement of weatherization services (prior written approval is required). The audit must provide an integrated cost effectiveness ranking of both structural and mechanical retrofit measures, and provide an estimated labor and materials cost for each measure. (See CSPM 608)

Note: In some cases (i.e., converted single family dwelling, townhouses), a NEAT audit or use of the "NEAT Weatherization Measures Priorities" may be appropriate for five unit or more multifamily buildings. In such cases, the LWO must contact the state weatherization office, provide appropriate documentation (i.e., building description, pictures, completed Building Check and Job Order Sheet) to justify use of the NEAT audit and receive written approval prior to the commencement of weatherization services.

MANDATORY WEATHERIZATION MEASURES

The following measures are required for one to four unit homes:

- Major Bypasses - Address in accordance with "Methods of Addressing Infiltration/Exfiltration" in Subject C.10 of this Section. Major bypasses, as determined by blower door testing, are generally defined as openings/direct penetrations to the interior, between heated and unheated areas, of ½ inch or greater, if in the pressure planes (foundation areas/ceiling and within three feet of the ceiling) and other specific large openings into heated areas (from unheated areas) which may be subject to leakage (i.e., broken glass, missing or broken windows and doors, open dryer vents). Examples of ½ inch gaps in the pressure planes that generally should be addressed:

  Access Openings
  Mechanical Penetrations
  Fireplace Damper
  Balloon Frame Construction
  Kneewall Floors

- Duct Sealing, Repair and/or Replacement - Address in accordance with Subject C.4 of this Section.

- Furnace Filters/Sealing Blower Compartment - Address in accordance with Subject C.4 of this Section.

- Duct and Pipe Insulation (if located in unheated areas) - Address in accordance with Subject C.4 of this Section.

EXCLUSION OF MEASURES/NO WEATHERIZATION WORK POSSIBLE

If any of the audit required measures are already in place or are not possible to perform, file documentation (on the Building Check and Job Order Sheet) will be required to clarify such situations (a brief explanation shall be noted in the appropriate section under “Comments” on the NEAT audit if used).

Health and safety factors which cannot be corrected and factors which would limit the effectiveness of any measure, properly documented would justify omission of that measure. Client circumstances (i.e., health) should also be considered. The client may refuse installation of one audit required measure. Weatherization work is prohibited if the client refuses two or more allowable and needed measures (refrigerators, compact flourescent light bulbs, clock setback thermostats, water heater treatment and low flow shower heads are not included and may be refused by the client without penalty).

If energy savings cannot be realized under this program due to the condition of a home, these conditions should be documented and the home should not be weatherized. Such conditions should be brought to the attention of the client with referrals to other help sources if available.

ADDITIONAL MEASURES/REPAIRS (MANDATORY & OPTIONAL)

The following weatherization measures, in addition to audit required measures, shall/may be addressed during the home weatherization work.

MANDATORY HEALTH AND SAFETY MEASURES:

Clothes Dryer Venting - Unvented clothes dryers shall be vented outside (see Subject C.13 in this Section).

Smoke Detectors - Smoke detectors shall be provided (see Subject C.11 in this Section).

OPTIONAL HEALTH AND SAFETY MEASURES:

Optional health and safety measures may be addressed in accordance with the Health and Safety Guidelines (see Section III of this Chapter).

OPTIONAL WEATHERIZATION MEASURES:

It will be the LWO's option to complete the following measures as weatherization measures on one to four unit homes, if it is felt there would be a benefit to the client and if installation of these items would not preclude installation of audit required weatherization measures:

- Low Flow Shower Head - Low flow showerheads may be installed in accordance with Subject E.1 of this Section.

- Water Heater Insulation - Water heaters may be insulated in accordance with Subject E.2 of this Section.

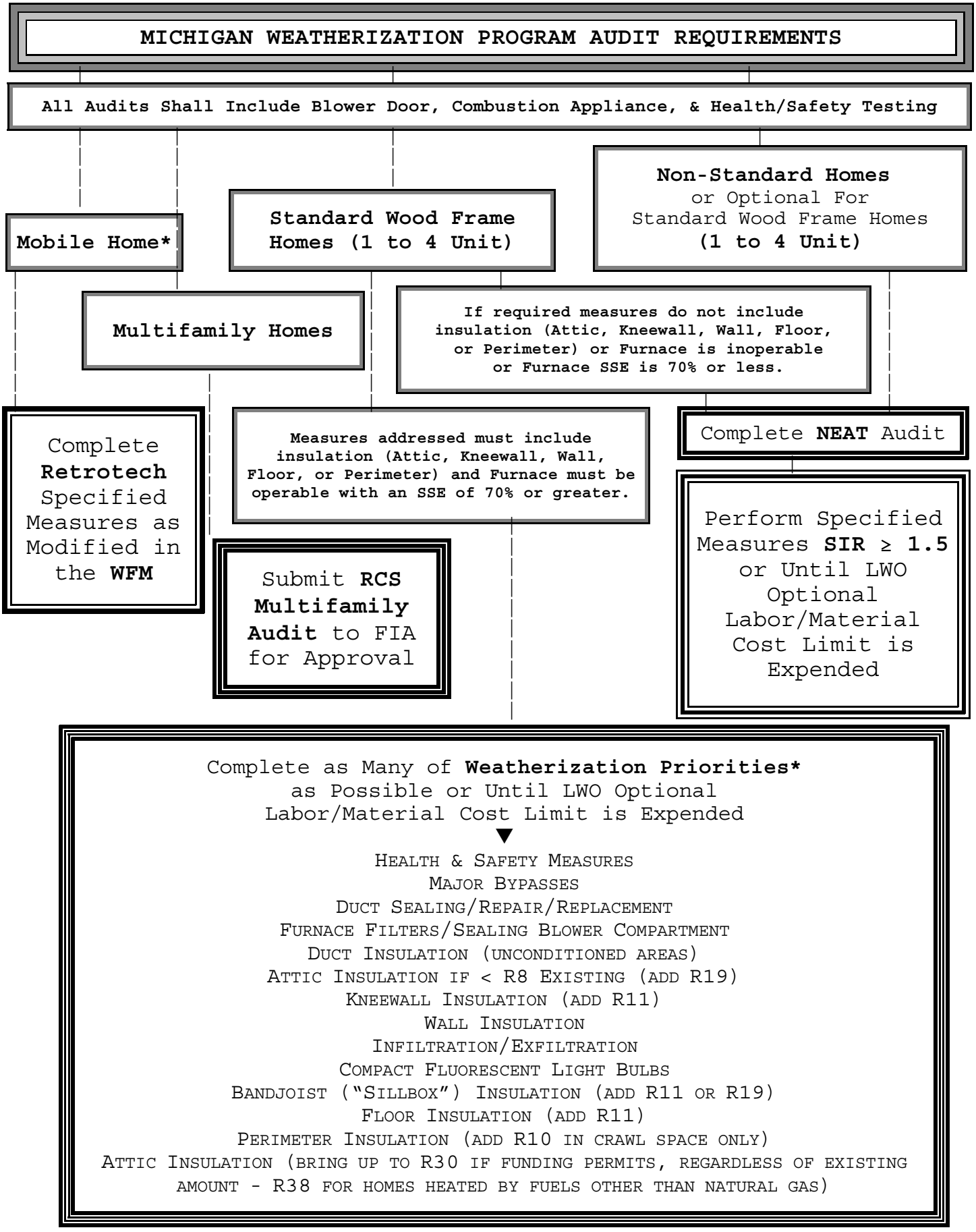
- Clock Set Back Thermostat - Set back thermostats may be installed in accordance with Subject E.3 if this Section.

- Heating System Tune-ups/Repairs - Heating system tuneups/repairs may be addressed in accordance with Subject E.4 of this Section.

LWOs should establish a local policy as to whether the installation of water heater insulation, low flow shower heads, and clock set back thermostats will be addressed.

INCIDENTAL REPAIRS:

"Incidental Repairs" means those repairs necessary for the effective performance or preservation of weatherization materials (see CSPM 607).



*Refrigerator to be evaluated using **NEAT** Audit or the **D&R International, LTD** audit.

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1. NATIONAL ENERGY AUDIT TOOL (NEAT) SETUP

This Subject contains requirements relative to the Setup of the NEAT Version 7.1.3 for use to complete audits as specified in Subject B of this Section. It also includes instruction relative to the Setup of the NEAT for use in sizing furnaces.

NAMING AGENCY'S MASTER NEAT SETUP/PARAMETER FILE

Agency's Setup/Parameter file including the following job costs, fuel costs/rates, candidate measures, weather data, and key parameters should be saved and renamed using agency acronym with the program year.

Example: The NEAT setup file named WAB1.MDB (found in C:\Program Files\Weatherization Assistant\ on the hard drive) for the Local Weatherization Operator in PY 02/03 would be LWO203.MDB for their master setup/parameter file.

MATERIAL AND LABOR COSTS

LWOs shall enter their material/labor costs for the allowable NEAT measures. The extent of the work for each measure which these costs should represent is specified in Subject B.2 of this Section.

Note: Material and Labor costs can be entered as a combined cost in one of the two columns (Material or Labor) or broken out in the Material and Labor columns, but the costs are not to be entered in all three columns (do not total in the Item Cost column). The Item Cost column is only used in the program for the Storm Window costs.

FUEL COSTS

LWOs may enter approved winter fuel cost data for their service area or utilize the default values in the NEAT setup.

For use of fuel costs other than the default values, documentation must be submitted to the State Weatherization Office for approval prior to implementation (refer to Required Documentation in this Section/Subject).

Note: LWOs may at their discretion utilize individual client fuel use data collected from the fuel supplier.

FUEL ESCALATION RATES AND DISCOUNT RATE

The Fuel Escalation Rates and Discount Rate used in the NEAT setup should not be altered. LWOs shall use the default values supplied in the NEAT program files.

ALLOWABLE NEAT CANDIDATE MEASURES

The NEAT setup shall allow for the consideration of the following Candidate Measures/weatherization measures:

Attic insulation (R11, R19, R30, and R38)
Fill Ceiling Cavity
Sillbox insulation
Foundation insulation
Floor insulation (R11 and R19, exclude R30)
Wall insulation
Wall insulation R11 batt
Storm windows
Flame retention burners
Replace heating system (80%-85%)
High efficiency furnace (90+%)
Lighting Retrofits (Compact Fluorescent Light Bulbs)
Refrigerator Replacement

LWOs shall turn off the following Candidate Measures in the NEAT setup (they are not allowable weatherization measures):

Floor insulation R30 (other levels are allowable)
Window Sealing
Window Replacement
Low E Windows
Duct Insulation (Mandatory Weatherization Measure, see WFM II.I.B)
Window shading
Sun screen Fabric
Sun Screen Louvered
Window Films
Thermal Vent Damper
Electric Vent Damper
Intermittent Ignition Devices (IID)
Electric Vent Damper IID
Furnace Tune-up (Optional Weatherization Measure - can be turned on as an agency option to measure its' SIR in relation to the other measures the agency is utilizing)
Smart Thermostat (Optional Weatherization Measure - can be turned on as an agency option to measure its' SIR in relation to the other measures the agency is utilizing)
Tune-Up Air Conditioners
Replace Air Conditioners
Evaporative Coolers
Replace Heat Pump
Water Heater Tank Insulation
Water Heater Pipe Insulation
Low Flow Showerheads (Optional Weatherization Measure - can be turned on as an agency option to measure its' SIR in relation to the other measures the agency is utilizing)
Water Heater Replacements

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WEATHER DATA

Weather data is determined by the State weatherization office for each LWO, based on climatological data from NOAA (Ashville, North Carolina) for the agency service delivery area. The closest representative heating degree days supplied in NEAT will be assigned/setup.

Note: Chart at the end of this Section/Subject lists appropriate NEAT Weather Data to be used by the LWO.

Alternative weather data may be used if submitted to and approved by the State Weatherization Office (see Required Documentation in this Section/Subject).

KEY PARAMETERS

The default values contained in the Key Parameters shall be utilized with the following exceptions:

Economics:

Minimum Acceptable SIR - 1.5

Set Points:

Daytime Heating Setpoint - Agency Discretion
Night time Heating Setpoint - Agency Discretion

Insulation and Heat Transfer:

R-value Added by Foundation Wall Insulation Measure - 11

R's/inch of “Other” Insulation Type - 3.14

User Defined Insulation Type:

User Defined Ceiling Insulation “Type 1" Name - F/GLASS BATT

User Defined Ceiling Insulation “Rs/Inch” - 3.14

User Defined Wall Insulation “Type 1" Name - F/GLASS BATT

User Defined Wall Insulation “Type 1 RValue” - 11

MODIFICATIONS OF NEAT SETUP/PARAMETERS

The NEAT Setup and Key Parameters may be modified as needed for a specific audit or audits with like variables.

The parameter setup with a specific variable which may be applicable to like structures would be given a different name for the specific setup variance (LWO203a) and a description of the setup variance should be noted.

Example: For homes in which attic insulation cannot be addressed the Agency's Master NEAT Setup/Parameter file would be modified to eliminate attic insulation as a candidate measure and that file would then be named LWO203a and described "Attic Insulation is not possible.

In cases where the NEAT Setup is not appropriate for a job, such as Candidate Measures which cannot be addressed on a job, such measures should be temporarily turned off in the NEAT Setup.

Note: Candidate Measures temporarily turned off or an agency specified measures variable in the NEAT Setup should be entered as a "Comment" on the General Information screen of the NEAT audit and recorded on page 1 of the Building Check and Job Order Sheet.

In cases where the Key Parameters (per this Subject) significantly vary from actual job conditions (i.e., the parameter for "Night Setback (F)" is the default value of 6.0 and the client states they will utilize a 10 degree night temperature setback), they can be modified temporarily for that job.

Note: Any temporary modification of the NEAT Setup and/or Key Parameters for an individual job should entered as a "Comment" on the General Information screen of the NEAT audit and be documented on page one of the BCJO for that job. The BCJO should also contain documentation as to why the Setup was modified.

Temporary modifications of the NEAT Setup and/or Key Parameters should be returned to the original values for future jobs.

REQUIRED DOCUMENTATION

LWOs shall submit to the State Weatherization Office written documentation of the changes to be made to the NEAT Setup and Key Parameters and why these changes are necessary for their agency prior to implementation and prior to any modification of the NEAT. In addition, documentation should be provided relative to the effective date of changes in the Setup.

Justification for modification of winter fuel costs and/or weather data must be submitted to the State Weatherization Office for approval prior to implementation.

FURNACE SIZING USING NEAT

In order to properly size furnaces using the NEAT, the setup should be temporarily modified to reflect the actual weatherization measures/Candidate Measures which will be addressed. All Recommended Measures, resulting from an executed audit, that will not be addressed should be temporarily turned

off in the Setup of Candidate Measures (i.e., measures not being addressed due to costs exceeding an LWO established labor and material cost limit, measures which cannot be completed due to client/job circumstances).

Candidate Measures temporarily turned off for the purpose of furnace sizing should be entered as a "Comment" on the General Information screen of the NEAT audit and recorded on page 11 of the BCJO.

Temporary modifications of the NEAT Setup and/or Key Parameters should be returned to the original values for future jobs.

FILE DOCUMENTS

The client/job files for units weatherized using NEAT audits shall include:

- NEAT Job Input Summary Report
- NEAT Output Summary Report

MICHIGAN WEATHERIZATION AGENCIES:
APPROPRIATE NEAT WEATHER DATA

Agency	Acronym	Largest Urban Area	Heating Degree Days	NEAT City	NEAT 7.1.3 Degree-Days
Allegan County Resource Development Committee	ACRDC	Allegan	6890	Grand Rapids	6949
Alger-Marquette Community Action Bureau	AMCAB	Marquette	8390	Alpena	8208
Baraga-Houghton-Keweenaw Community Action Agency	BHKCAA	Houghton	9400	Sault Sainte Marie	9409
Community Action Agency of South Central Michigan	CAASCM	Battle Creek	6580+	Grand Rapids	6949
Capitol Area Community Services	CACS	Lansing	6940	Grand Rapids	6949
Chippewa-Luce-Mackinac Comm Action & Human Res., Inc.	CLMCA	Sault Sainte Marie	9050	Sault Sainte Marie	9409
City of Dearborn	DBN	Dearborn	6290	Detroit	6730
Downriver Community Conference	DCC	Southgate	6290	Detroit	6730
Detroit Department of Human Services	DHSD	Detroit	6290	Detroit	6730
Dickenson-Iron Community Services Agency	DICSA	Iron Mountain	8673	Alpena	8208
EightCAP, Inc.	ECAP	Mt. Pleasant	7050	Flint	7103
Economic Opportunity Committee of St. Clair County, Inc.	EOCSCC	Port Huron	6564	Detroit	6730
FiveCAP, Inc.	FCAP	Luddington (Hart)	6950	Grand Rapids	6949
Genesee County Community Action Agency	GCCAA	Flint	7200	Flint	7103
Gogebic - Ontonagon Community Action Agency	GOCAA	Ironwood	8898	Sault Sainte Marie	9409
Human Development Commission	HDC	Flint	7200	Flint	7103
Kalamazoo County Human Development Bureau	KCHDB	Kalamazoo	6260	Detroit	6730
Area Community Services Employment and Training Council	ACSETC	Grand Rapids	6890	Grand Rapids	6949
Macomb County Community Service Agency	MCCSA	Detroit	6290	Detroit	6730
Monroe County Opportunity Program	MCOP	Monroe*	6290	Detroit	6730
Menominee-Delta, Schoolcraft Community Action Agency	MDSCAA	Escanaba	8481	Alpena	8208

MICHIGAN WEATHERIZATION AGENCIES:
APPROPRIATE NEAT WEATHER DATA

Agency	Acronym	Largest Urban Area	Heating Degree Days	NEAT City	NEAT 7.1.3 Degree-Days
Mid-Michigan Community Action Agency	MMCAA	Mount Pleasant	7017	Flint	7103
Muskegon - Oceana Comm. Action Against Poverty	MOCAAP	Muskegon (Hart)	6950	Grand Rapids	6949
Northeast Michigan Community Services Agency	NEMCSA	Alpena	8510	Alpena	8208
Northwest Michigan Human Services	NWMHSA	Traverse City	7700	Traverse City	7744
Ottawa County Community Action Agency	OCCAA	Holland	6890	Grand Rapids	6949
Oakland -Livingston Human Services Agency	OLHSA	Pontiac	6290	Detroit	6730
Community Action Agency of Jackson - Lenawee - Hillsdale	CAAJLH	Jackson	6940	Grand Rapids	6949
Southwest Michigan Community Action Agency	SMCAA	Kalamazoo	6260	Detroit	6730
Saginaw County Community Action Committee, Inc.	SCCAC	Saginaw	7120	Flint	7103
Washtenaw County Human Services Department	WCHSD	Ann Arbor	6290	Detroit	6730
Wayne County Weatherization	WCWx	Westland	6290	Detroit	6730
Wayne Metropolitan Community Services Agency	WMCSA	Ecorse	6290	Detroit	6730

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2. COMPLETION OF NEAT AUDITS

The completion of an individual NEAT audit (Subject B of this Section states when NEAT Audits should be utilized) will require a thorough preinspection, including completion of the Building Check and Job Order Sheet (BCJO - FIA 4284 - revised 11/02) which includes all information as required to complete all NEAT data screens. Any attachments containing audit-related additional information shall be referenced on the BCJO.

Data entries required to complete individual NEAT audits shall be completed in compliance with the NEAT Manual instructions and in accordance with the following:

General Information(pertaining to the home and audit)

- **Client Information:** Client's name, address, etc.
- **Audit Information:** Audit date, Auditor (Inspector), Job Identifier (Agency Job Number)
- **House Data:** Number of Conditioned Stories, Living Space Floor Area, and Average Number of Occupants.

Ducts and Infiltration

- **Pre-Infiltration Reduction Leakage Rate from Blower Door (CFM):** The CFM @ 50 Pa as determined by preinspection blower door testing (Section IV.A of this Chapter). In cases where 50 Pa House Pressure cannot be reached, enter the actual house pressure.
- **Post-Infiltration Leakage Rate from Blower Door (CFM):** The post weatherization CFM @ 50 Pa projected (the higher of the "CFM Percent" projection based on ACH percent reduction requirements or the "Minimum CFM"/higher of CFM Persons or CFM Bedrooms).
- **Cost of Air Leakage Rate Reduction ($):** This includes the estimated labor and material costs of addressing Major Bypasses and Infiltration/Exfiltration Measures as required to achieve projected post weatherization CFM Goal.
- **Evaluate Duct Sealing:** The box will be un-checked as duct sealing is a required measure of Michigan's WAP.

Exterior Walls

The cost incorporated in the audit generally covers agency pricing for labor and materials required to complete normal wall preparation and insulation requirements (i.e.,drilling holes, sealing minor openings

where insulation may escape, blowing walls to an R11-13 level, and plugging holes).

Added Insulation Cost may include the additional cost of insulating a deeper wall (i.e., 2 x 6 walls), repairs needed prior to insulating (i.e., installation of "S" type fuses, patching siding), and other additional costs (i.e., if siding removal/conditions result in additional costs to complete wall insulation). An explanation of the reason for the "Added Cost" shall be identified in the wall **Comments** section of the NEAT audit Wall screen and costs shall be itemized in the "Additional Wall Insulation Costs" section of the BCJO. As an alternative, such costs may be recorded as "Incidental Repair Costs" or "Miscellaneous Costs" on the BCJO (and totals recorded as "Itemized Costs") and entered in the NEAT audit as **Itemized Costs** (see page 6 of this Section/Subject).

Windows

Prime windows may be addressed as "Major Bypasses" (see Subject B, page 4 of this Section) or Infiltration/Exfiltration Measures (see Subject C.12 of this Section) when determined necessary by the preinspection/blower door testing.

NEAT will evaluate SIRs for new storm windows (the NEAT will not automatically assign a **Window Code**, the code is generated by the inspector for each line entry of the windows (i.e. WD1). The cost incorporated in the audit for Michigan for the storm windows will cover agency pricing for the labor and materials to complete the installation of a storm up to a maximum of 101 united inches (width + height). **Cost ($)** (labor and material x number of windows) shall be entered only for storms over 101 united inches; this will overwrite the default price.

Basement storms shall be entered in the "Miscellaneous Costs" section of the BCJO (and totals recorded as "Itemized Costs") and computer data entry screen of the NEAT audit, **Itemized Costs** (see page 6 of this Section/Subject).

Doors

Prime doors and storm door repairs may be addressed as "Major Bypasses" (see Subject B page 4 of this Section) or Infiltration/Exfiltration Measures (see Subject C.12 of this Section) when determined necessary by the preinspection/blower door testing. NEAT will not automatically assign a **Door Code**, the code is generated by the inspector for each line entry of the doors (i.e. DR1).

Unfinished Attic Areas/Finished Attic Areas

The cost incorporated in the audit generally covers agency pricing for labor and materials to complete normal insulation and attic prep requirements (i.e., barriers for heat sources, sealing openings, insulation to the stated R value, insulate and weatherstrip an existing attic access).

Additional Installation Cost may include labor and material costs for venting, a new attic access, pipe wrap, venting of ceiling fans, and repairs needed prior to insulating (i.e., patching roof, repairing wiring). Such costs shall be identified in the **Comments** section of the NEAT audit for this measure and the costs shall be itemized in the "Additional Attic Insulation and/or Ventilation Costs" section of the BCJO. As an alternative, these costs may be recorded as "Incidental Repair Costs" or "Miscellaneous Costs" on the BCJO (and totals recorded as "Itemized Costs") and entered in the **Itemized Costs** computer data entry screen of the NEAT audit (see page 6 of this Section/Subject).

Separate attic areas which differ (i.e., main attic is uninsulated and a separate attic for an addition has an existing R-19) shall be assigned different **Measure Numbers**. In cases where existing insulation is present, the NEAT entry should still call for **Additional Insulation** so as to allow NEAT to determine whether additional insulation is cost effective (don't "0" out **Additional Insulation** because of existing insulation, unless there is another justified reason such as moisture problems which would be entered in the "Comments" section and noted on the BCJO).

Note: If attic insulation is not being addressed but attic ventilation is needed (as determined by the preinspector or if R-19 or greater insulation exists, ventilation is required pursuant to Section I.C.2 of this Chapter), ventilation costs shall be entered in the **Itemized Costs** computer data entry screen of the NEAT audit, (see page 6 of this Section/Subject). Costs should be entered in the "Miscellaneous Costs" and "Itemized Costs" section of the BCJO (and totals recorded as "Itemized Costs").

Foundation Spaces

The cost incorporated in the audit to address foundation areas ("Sill Insulation", "Floor Insulation", or "Foundation Insulation") generally covers agency pricing for labor and materials to complete normal prep requirements, insulating to the stated R value, and insulating and weatherstripping an existing access.

Added Cost for foundation spaces may include labor and material costs for venting, a new access, pipe wrap and repairs needed prior to insulation (i.e., replace foundation block). Such costs shall be

identified in the **Comments** column of the NEAT audit for this measure. These costs should be recorded as "Additional Foundation and/or Band Joist Insulation Costs" on the BCJO. As an alternative, such costs may be recorded as "Incidental Repair Costs" or "Miscellaneous Costs on the BCJO (and totals recorded as "Itemized Costs") and entered in the **Itemized Costs** computer data entry screen of the NEAT audit (see page 6 of this Section/Subject).

Combined foundation areas may be separated by assigning different **Measure Numbers** (i.e., a heated basement and unheated crawl space would be listed separately and have different **Measure Numbers** assigned).

The **Type** shall be indicated for each foundation area in accordance with the NEAT Manual instructions for **Foundation Spaces** (i.e., "Conditioned" - "means the space has active thermostat control").

The NEAT audit will not allow a vented (Type "V") foundation area to be addressed with perimeter insulation as it considers it "Vented Non-Conditioned". The intent in Michigan of addressing perimeter insulation in a vented foundation area is that it is either "Conditioned" or "Unintentionally Conditioned" due to existing circumstances and operable vents are in place or can be added to replace fixed vents. Therefor in these situations foundation areas are to be entered in the audit as "Conditioned" or "Unintentionally Conditioned" and appropriate steps taken for operable vents.

If a foundation area cannot be addressed (i.e., basement living area with drywalled ceiling), this area can be excluded from evaluation by entering "None" in the "Foundation Insulation Mode" section. All other data entries should be completed in this section as required in the NEAT manual.

Notes: In cases where a foundation area cannot be addressed or only sillbox insulation is being evaluated, the reason shall be documented on the BCJO and in the **Comments** section of the NEAT audit for this foundation area.

If foundation insulation is not being addressed (i.e., existing) but foundation ventilation is needed (as determined by the preinspector or per requirements of Section I.C.7 of this Chapter), ventilation costs shall be entered in the "Miscellaneous Costs" and "Itemized Costs" sections of the BCJO and costs should be entered in the **Itemized Costs** computer data entry screen of the NEAT audit (see page 6 of this Section/Subject).

Lighting

A lighting code shall be assigned by the inspector for all incandescent light bulbs to be replaced (up to eight bulbs) with compact fluorescent

light bulbs. Other required information should be completed in the NEAT audit relative to each bulb being replaced.

Air Conditioners-Central/Window

Entries should be completed on this NEAT audit screen whenever central and/or window air conditioners are being utilized. Information relative to air conditioning should be recorded in the "NEAT-Air Conditioners" section of the BCJO.

Heating Systems/Primary Furnace-Boiler/Space Heaters/Other Systems

These entries include data for various types of heating systems/duct insulation. Testing shall be completed by a certified inspector or a licensed mechanical contractor. In lieu of testing (testing is required unless there is a specific reason it cannot be completed, which should be documented in the **Comments** section of the NEAT audit and on the BCJO), data can be taken from the heating system data plate and entered in the appropriate area on the NEAT audit.

If the kBtu information is not available, the input of the furnace can be determined by clocking the meter. For heating systems without an efficiency rating available and if efficiency testing is not possible to perform, the following guidelines can be utilized:

Gas - furnace-70 percent, boiler-74 percent, space heater-70 percent

Oil - furnace-68 percent, boiler-70 percent, space heater-70 percent

Wood - 50 percent

When the heating system is missing or inoperable beyond repair, in the NEAT Audit (use the data plate "Btu input" or Manual "J"), check "poor" condition in the audit, enter a steady state efficiency rate of **10%**, and indicate "**Replacement Mandatory**".

For a furnace/boiler/space heater with a steady state efficiency of less than "**70%**" (use the actual tested SSE in the NEAT audit and select "Optional" heating system retrofit).

Vent dampers are not an approved weatherization measure in Michigan and should not be **Recommended** in the NEAT audit.

Itemized Costs

"**Health and Safety Costs**" - Include all labor and material costs projected for health and safety measures. This includes mandatory

health and safety measures (smoke detectors and clothes dryer venting) and optional health and safety measures, as determined by the LWO, to be completed on a home (see Section III of this Chapter). Health and safety measures shall be identified and broken out in the "Health and Safety Costs" section of the BCJO (and totals recorded as "Itemized Costs") and entered in the NEAT audit as **Itemized Costs,** as the following example indicates:

> The smoke detector costs are included in the audit as a "Health and Safety" measure by inserting the data in the computer screen **Itemized Costs** as follows: 1. Enter "Health and Safety" in the **Description** section; 2. Enter total material and labor costs in the **Cost** section; 3. Insert a "√" in the **Include in SIR** section; and 4. Enter the materials (i.e., 1 Smoke Detector) in the **Materials** section.

"**Duct Sealing/Repair/Replacement Costs**" - Include all labor and material costs projected to complete these measures (see Subject C.4 of this Section). These costs shall be broken out in the appropriate sections of the BCJO (and totals recorded as "Itemized Costs") and entered in the NEAT audit as **Itemized Costs**, as the following example indicates:

> The duct sealing costs are included in the audit as "duct sealing" by inserting the data in the computer screen **Itemized Costs** as follows: 1. Enter "duct seal/repair/replacement" in the **Description** section; 2. Enter total material and labor costs in the **Cost** section; 3. Insert a "√" in the **Include in SIR** section; and 4. Enter the materials (i.e., 15ft duct seal) in the **Materials** section.

"**Incidental Repair Costs**" - Include all necessary labor and material costs projected to complete "incidental repairs" (see Section I.A of this Chapter) which are not being entered as additional installation costs relative to a weatherization measure. These costs shall be identified in the "Incidental Repair Costs" section of the BCJO (and totals recorded as "Itemized Costs") and entered in the NEAT audit as **Itemized Costs** as the following example indicates:

> Chimney liner costs are included in the audit as "Incidental Repair Costs" by inserting the data in the computer screen **Itemized Costs** as follows: 1. Enter "Incidental Repair" in the **Description** section; 2. Enter total material and labor costs in the **Cost** section; 3. Insert a "√" in the **Include in SIR** section; and 4. Enter the materials (i.e., 25ft chimney liner) in the **Materials** section.

"**Miscellaneous Costs**" - Include all labor and material costs required to complete basement storms, incidental measures (i.e., venting an attic when attic insulation is not being addressed, pipe insulation), etc. These costs shall be broken out in the "Miscellaneous Costs" section of

the BCJO (and totals recorded as "Itemized Costs") and entered in the NEAT audit as **Itemized Costs**, as the following example indicates:

> The attic venting costs are included in the audit as a "Miscellaneous" measure by inserting the data in the computer screen **Itemized Costs** as follows: 1. Enter "Miscellaneous" in the **Description** section; 2. Enter total material and labor costs in the **Cost** section; 3. Insert a "√" in the **Include in SIR** section; and 4. Enter the materials (i.e., 4 R60 Roof Vents) in the **Materials** section.

"**Optional Weatherization Measures Costs**" - Include all labor and material costs required to address furnace tuneups, clock setback thermostats, water heater insulation and low flow shower heads (see Subject B of this Section). These costs shall be broken out in the "Optional Weatherization Measures Costs" section of the BCJO (and totals recorded as "Itemized Costs") and entered in the NEAT audit as **Itemized Costs**, as the following example indicates:

> The furnace tuneup costs are included in the audit as an "Optional" measure by inserting the data in the computer screen **Itemized Costs** as follows: 1. Enter "Optional" in the **Description** section; 2. Enter total material and labor costs in the **Cost** section; 3. Insert a "√" in the **Include in SIR** section; and 4. Enter the materials (i.e., Furnace Tuneup) in the **Materials** section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C
	Date Issued: January 1997		
Subject: Weatherization Measures Standards and Specifications	**Supersedes:** June 1994		
	Page 1		

C. WEATHERIZATION MEASURES STANDARDS AND SPECIFICATIONS

Standards and specifications pertaining to Weatherization Measures are contained in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.1
	Date Issued: November 2002		
Subject: Standards and Specifications Attic Insulation	**Supersedes:** August 1997		
	Page 1		

1. ATTIC INSULATION

When called for by the NEAT audit or the measures priorities (see Section I.B. of this chapter) all attic areas (attic floors, kneewalls, and slopes) between heated and unheated areas shall be insulated.

INSULATION LEVELS

Install ceiling insulation at the level determined by the NEAT audit.

Homes weatherized in accordance with the priorities system for standard wood frame construction shall receive an additional R19 in cases where less than R8 is existing. If funds permit, the level can be brought up to an R30 regardless of the amount of existing insulation or an R38 where the degree days exceed 6300 and the primary heating fuel source is other than natural gas.

PRECAUTIONS AND ATTIC PREPARATION REQUIREMENTS

Inspect the areas to be insulated to identify potential safety hazards. Ensure that the ceiling and roof are structurally sound and able to support additional loads. Also, ensure that there are no uncorrected moisture problems. If any such problems are not corrected, the ceiling should not be insulated.

Junction boxes and wire drops do not require a barrier, but may be blown over after it has been verified that they are covered and in good repair. It is also recommended (at agency discretion) that junction boxes which are blown over be flagged.

Identify and provide barriers for all recessed lighting fixtures (including wiring compartment and ballasts), furnaces, chimneys, flues, knob and tube wiring, motors, vents/fans, door bell transformers, and other heat producing devices in all areas where insulation is to be installed. Install noncombustible barriers (i.e., metal or unfaced mineral fiber batts) around all heat producing sources to permanently maintain a minimum 3" dead air space (clearance of insulation from attic furnaces and other heat producing sources must be provided in accordance with the governing code). All barriers should extend at least 2" above the height of the finished insulation. Do not cover these devices so as to entrap heat or prevent the free circulation of air unless they are approved for this purpose. Attic ceiling access barriers are to be made of a rigid material (i.e. plywood, pine, etc.).

In the case of wiring that is cracked, frayed, deteriorated, or otherwise in question, do not add insulation to this area (unless the wiring is inspected and repaired by a licensed electrician).

Dryer, kitchen, and bath fan vents which terminate in the attic should be eliminated or extended to the outside. Duct work for venting dryers or kitchen fans shall be aluminum or galvanized sheet metal, or a labeled

aluminum flex duct. Any vent duct passing through the unheated attic should be insulated. Vents so extended should be equipped with a water-proof cap with a back damper.

Heat ducts and pipes passing through unheated attic areas should be insulated. Before insulating, ducts and pipes shall be inspected. Ducts shall be sealed, and supported. Refer to Subject C.4 in this section.

In homes that have soffit vents either in place or to be installed, some form of barrier must be installed to assure that insulation does not block the vent; thus, allowing for a free flow of air.

Notes: In no case should any vent be blocked.

Prior to insulation, all by-passes between heated and unheated areas shall be air-sealed (i.e., ceiling penetrations, balloon frame construction, floor cavity below kneewall) and all venting and attic prep requirements should be completed. Refer to Subject C.10, Infiltration/Exfiltration Measures, in this section.

CEILING INSULATION APPLICATION

Install all insulation material in accordance with requirements of the governing code and the manufacturer's recommendations and keep it dry and free of extraneous materials.

For pneumatic installation, use only equipment compatible with the insulation material and operate the equipment according to the manufacturer's instructions. Use the minimum air pressure meeting the manufacturer's instructions.

Do not blow insulation into electrical devices or into vents which open into the attic or areas that have been blocked off during attic preparation. If insulation is blown in accidentally, such insulation must be removed carefully to prevent damage.

When installing batts or blankets over existing insulation, make sure that a vapor barrier is not inserted between layers of insulation.

Cut batts so that the ends close to heat-producing devices are the required three inches from such devices.

Note: Insulation left exposed to the interior shall have a flame spread classification not to exceed 150.

KNEEWALL INSULATION APPLICATION

Unheated kneewall areas adjoining a heated area should be insulated to a minimum R11.

Inspect the area to be insulated to identify potential safety hazards, defective wiring, heat-producing devices, etc.

Install a minimum R11 batt or blanket-type insulation. If a vapor barrier exists, install vapor barrier on the warm (heated) side of the wall and secure insulation (without compressing) within stud space of kneewall. Ensure that insulation fills the stud space.

SLOPED CEILING INSULATION APPLICATION

Inspect the area to be insulated to identify potential safety problems.

Sloped ceiling areas can be insulated with batt or blanket-type insulation, or the cavity between the sloped ceiling and roof can be blown with loosefill insulation.

Insulation should be placed to allow an air space across the top of the slope cavity. Batts of less thickness than the depth of the cavity should be used. Loose fill depth should be limited by installing baffles within each cavity, where possible. If baffles cannot be placed, a shallow blow should be completed so as to leave an air space above the insulation.

As an alternative, sloped ceiling areas can be blown full to a high density (dense-pack). In such cases, cavities should be air sealed from other attic spaces.

If the insulation installed has a vapor barrier, it must be installed on the warm (heated) side of the ceiling. Provide a three-inch minimum clearance around all heat-producing sources.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.2
	Date Issued: November 2002		
Subject: Standards and Specifications Attic Ventilation	**Supersedes:** June 1999		
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2. ATTIC VENTILATION

Proper and adequate ventilation must be included to ensure the effectiveness of the insulation and guard against deterioration caused by moisture accumulation. Ventilation is mandatory whenever ceiling insulation (R19 or greater) exists or is to be added.

VENTILATION REQUIREMENTS (FORMULAS)

If only high vents can be installed, a minimum ratio of 1/300 is required (one square foot net free area of ventilation for each 300 square feet of ceiling area). Rule of thumb — 1 square inch of vent / 2 square feet of ceiling. Where at least 50 percent of venting is provided by soffit vents, and at least 50 percent of the venting is located as high sources of ventilation (minimum of three feet above soffit vents), a minimum ratio of 1/600 is allowed (rule of thumb — 1 square inch of vent / 4 square feet of ceiling). Existing vapor barriers, high and low venting (50/50 split), and good vent distribution may be considered when determining venting needs. Such conditions would allow for the reduction of venting below the level required by the 1/300 ratio. In such cases, venting shall not be reduced to the 1/600 ratio.

Note: The vent area/placement of existing vents shall be utilized in determining requirements for new ventilation/deducted from the total ventilation needs calculated (i.e., an 800 square foot attic calculated for venting utilizing the 1 square inch / 4 square feet formula would require 100 square inches of soffit venting and 100 square inches of high venting). There is an existing gable vent found, placed high. The size [net free vent area] is not stamped on the vent; therefore, the screened opening is measured. An 8" X 10" vent/screened opening is calculated for gross vent area by multiplying the opening width by the height or 80 square inches. To determine the net free vent area, 50 percent of the gross vent area is utilized [reducing area due to blockage from insect screening and louvers], 40 square inches net free ventilation. Since the existing gable vent was located high, the overall new high ventilation requirement would be 60 square inches [100 square inches total high venting required - 40 square inches existing gable vent = 60 square inches new high ventilation required]).

VENT PLACEMENT, STANDARDS AND REQUIREMENTS

Ventilators should be placed so as to eliminate still air pockets in the attic. This may be accomplished by distributing lower ventilators as widely as possible (on all sides). Ventilators should be equally spread to address all attic areas in compliance with the above formulas.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.2
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Subject: Standards and Specifications Attic Ventilation	**Supersedes:** June 1999		
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Various types of vents may be used. Vent openings must be a minimum of 1/8" and may not exceed 1/4". Large "can" type roof vents (144 square inches free air) shall not be utilized as low-venting.

In slate or clay tile roof applications, a combination of gable-end and soffit vents should be used when possible.

All ventilators shall be installed in accordance with manufacturer's recommendations. Holes shall be cut to provide a free opening at least equal in size to the opening in the ventilator. There shall be no obstructions in the line of the vent opening. Be sure to cut and place ventilators so as to avoid rafters and other structural components. Low ventilators should be placed a minimum of one foot above the level insulation will be blown. Soffit vents and other low vents, which would cause blowing of loose fill insulation, should be provided with adequate baffling so as to deflect air above the surface of the attic insulation and to prevent blockage of the vents (or blanket insulation may be stapled in these areas allowing for sufficient clearances). All necessary precautions should be taken to ensure a watertight installation. Roofing should overlap roof "cans" at the top in all cases and sides, when possible.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.3
	Date Issued: November 2002		
Subject: Standards and Specifications Band Joist (Sillbox) Insulation	**Supersedes:** January 1997		
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3. BAND JOIST (SILLBOX) INSULATION

When called for by the NEAT audit or the measures priorities (see Section I.B. of this chapter), all band joist pockets located between heated and unheated areas shall be insulated.

INSULATION LEVEL/REQUIREMENTS

When called for, batt or blanket insulation shall be installed in the band joist pockets between heated and unheated areas; R-value will be determined by the depth of the pocket from the band joist to the face of the foundation wall (up to a maximum R-19). Insulation shall meet the requirements of the governing code and the flame spread classification shall not exceed 150.

INSULATION APPLICATION

Band joist insulation shall be provided for all band joist pockets between heated and unheated areas when required. Batt or blanket insulation shall be cut slightly oversized for each band joist pocket, so that when installed it will form a snug fit (be in contact with floor joist on both sides, subfloor at the top, and sill plate/foundation wall at the bottom) without compression. Insulation should be placed in contact with the band joist.

Note: Prior to insulation, all by-passes in the band joist/sill plate area shall be air-sealed in accordance with the requirements of Subject C.10, Infiltration/Exfiltration Measures, in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.4
	Date Issued: November 2002		
Subject: Standards and Specifications Duct/Pipe Insulation/Repair	**Supersedes:** June 1999		
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4. DUCT/PIPE INSULATION/REPAIR

Ducts and pipes (including boiler pipes) located in unheated or areas which are being insulated and ventilated (i.e., attics and crawl spaces) shall be insulated.

INSULATION LEVEL

When called for, install a minimum R-3 flexible or rigid type insulation on all heat and return air ducts exposed to unheated areas, and a minimum R-3.5 pipe insulation on all water and heat pipes exposed to unheated areas. Various type duct and pipe insulations are acceptable based on compliance with DOE/WAP Appendix A (see Chapter III, Section III.A.1, Minimum Standards for Wx Materials) and commercial availability.

Notes: The maximum flame spread classification for duct and pipe insulation is 150. Insulation for ducts subject to routine human contact shall be classified Type 2 or 3, Class A material, and have a facing with a flame spread rating of 50 or less. All materials used in conjunction with pipe insulation must be capable of continuous operation at 180°F and have a smoke density rating of 50 or less.

PRECAUTIONS AND PREPARATION REQUIREMENTS

All ducts (including heat and return air runs) and pipes shall be thoroughly inspected for leakage and proper support. Leaking ducts and pipes shall not be insulated. Additional support straps shall be provided for ducts and pipes as necessary.

Check to ensure dampers in ducts and valves in heat pipes to heated areas are open and those to unheated areas are closed. Also check for furniture and drapes blocking registers and return air grills. Explain any problems to client and provide client education as needed relative to the heating system.

DUCT SEALING/REPAIR/REPLACEMENT

Seal, repair and/or replace all heat and return air ducts as necessary to insure the integrity of the supply and return systems.

Where possible, problems related to the fit of ductwork shall be corrected regardless of location of ductwork (both in heated and unheated areas). Problems with ducts including the repair of the furnace blower compartment if required may be corrected using sheet metal screws, a high quality foil tape, sheet metal, a duct sealant, or foam. Typical problems include ducts disconnected at joints, holes in ducts, seams in ducts open, and bent ducts.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.4
	Date Issued: November 2002		
Subject: Standards and Specifications Duct/Pipe Insulation/Repair	**Supersedes:** June 1999		
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DUCT AND PIPE INSULATION APPLICATION

All heat and return air ducts, hot water and steam heating pipes, and water supply pipes which pass through unheated areas or areas which will be made unheated by insulating (i.e., pipes and ducts located below a floor to be insulated) shall be insulated. Install all insulation materials in accordance with requirements of the governing code and the manufacturer's recommendations. Insulation shall be secured without gaps at joints and cover all duct/pipe surfaces. If wire is used to secure insulation, it shall be a minimum 18 gauge non-rusting metal.

Fasteners shall not compress insulation more than 50 percent of its normal thickness. All "Ts," elbows, and bends shall be completely insulated. Pipe insulation shall be taped (using a high quality tape with good adhesion), caulked (with appropriate caulk to secure and adhere to insulation), or glued at all joints. Where freezing pipes are determined to be a potential problem, electric, freeze-prevention tape (UL labeled) can be installed prior to insulating.

Notes: Allow 3' of clearance between the furnace/boiler and insulation. Insulation shall be maintained a minimum 6" clear from exhaust vents (18" for single wall vents to oil, wood, and coal furnaces). Do not insulate over control and safety devices, pumps, valves, boiler feed lines, pressure relief devices, dampers, or vents.

FURNACE FILTERS/SEALING BLOWER COMPARTMENT

Dirty or non-existent furnace filters shall be replaced as a part of this measure with a properly sized commercially available filter. Ensure that the blower compartment is sealed (i.e., openings sealed, properly fitting door, a filter rack cover is in place, etc.).

DUCT SIZING

In cases where new duct work is being installed, sizing of supply and return ducts should be determined in accordance with the BTU rating of the heating unit.

Rule of Thumb: 2 square inches of duct opening per 1000 BTU/hr. output for both supplies and returns.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.5
	Date Issued: November 2002		
Subject: Standards and Specifications Floor Insulation	**Supersedes:** January 1997		
	Page 1		

5. FLOOR INSULATION

When called for by the NEAT audit or the Measures Priorities (see Section I.B. of this chapter), floors between heated and unheated areas shall be insulated.

INSULATION LEVEL

Install insulation in floor joist cavities at the level determined by the NEAT audit whenever floor insulation is called for.

Homes weatherized in accordance with the priorities system for standard wood frame construction shall be insulated to an R11 level.

FLOOR INSULATION APPLICATION

Floor insulation should be installed, when practical, over unheated crawl spaces or unheated basements (between all heated rooms and unheated foundation areas).

Notes: 1. Areas where furnaces are located are considered heated.

2. Areas where furnaces are located that are classified as “Conditioned” or “Unintentionally Conditioned” in the NEAT audit should be treated as heated areas.

Insulation shall be installed in accordance with the requirements of the governing code and the manufacturer's recommendations. If the insulation has a vapor barrier, it should be installed on the warm (heated) side. Insulation should be installed so as to completely fill the cavity between the floor joists, butting snugly against floor joists and box sill. Add support for insulation between joists with bowed wire supports, or other effective support, such as nylon mesh or galvanized screen, held in place by stapling or nailing. Insulation should be installed snug to the subflooring and should not be compressed.

When making installations around bridging or cross bracing of floor joists, fit the insulation tightly around these obstructions and make sure there are no gaps in it.

In order to prevent pipes located within the joist cavities from freezing, where practical, insulation should be installed below the pipes (so that pipes remain between the insulation and the heated floor). Insulation should also be installed below heat ducts where practical (in such a manner so that ducts are protected from exposure to the cold foundation space). Ducts and pipes below the floor insulation shall be wrapped. (Refer to Subject C.4 in this Section).

Note: Prior to insulation, all by-passes between the unheated foundation areas and heated areas shall be air-sealed (i.e., floor penetrations, balloon frame construction). Refer to Subject C.10, Infiltration/Exfiltration Measures, in this Section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.5
	Date Issued: November 2002		
Subject: Standards and Specifications Floor Insulation	**Supersedes:** January 1997		
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GROUND COVER

All dirt floors must be covered with a minimum six mil polyethylene film held in place with rocks, boards, earth, or sand. If it is necessary to use more than one piece, overlap joints, be sure to have at least a 12-inch overlap, weighted down. Ground cover should also extend up foundation walls approximately six inches and should be weighted down around the outside perimeter.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.6
	Date Issued: November 2002		
Subject: Standards and Specifications Foundation/Perimeter Insulation	**Supersedes:** January 1997		
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6. FOUNDATION/PERIMETER INSULATION

When called for by the NEAT audit or the Measures Priorities (see Section I.B. of this Chapter), all foundation walls between heated and unheated areas shall be insulated.

INSULATION LEVEL

Install a minimum R10 insulation on foundation perimeter walls whenever foundation (perimeter) insulation is called for.

PERIMETER INSULATION APPLICATION

Perimeter insulation shall be installed when practical (in areas where floor insulation is not being utilized) along foundation walls to separate heated from unheated areas. Insulation used shall be appropriate for the application and installed in accordance with requirements of the governing code and the manufacturer's recommendations.

Heated foundation areas (basements and crawl spaces) should be provided with perimeter insulation where possible. Perimeter insulation can also be utilized as an alternative to floor insulation in situations in which floor insulation is not practical, including the following:

1. Furnace located below the floor level and within the foundation area.

2. Extensive duct work located below the floor joists.

3. Plumbing located below the floor joists (which may be susceptible to freezing).

4. Client usage of below floor areas which requires heat.

5. Pumps, water heaters, or other equipment located below the floor level (which may be susceptible to freezing).

6. Situations where portions of the floor are not accessible to do floor insulation (but the perimeter is accessible).

Install a batt, blanket, or rigid board insulation on either side of foundation walls extending the full height from the foundation floor or footing to the bottom of the subflooring or first row of siding. If the footing or foundation floor is not below the frost line, the insulation must be installed to extend two feet horizontally from the foundation wall at the bottom. Insulation should be installed to butt snugly together and flush where pieces meet, and should be tight to surfaces at the top and

bottom, fastened, and protected in accordance with the manufacturer's instructions for the type of insulation utilized. If a vapor barrier exists, it should be installed on the warm (heated) side of the foundation. Insulation shall be kept a safe distance from heat sources.

Note: Prior to insulation, all by-passes between heated foundation areas and unheated areas shall be air-sealed (i.e., foundation wall penetrations, cores of block opening into heated areas, gaps at sill plate). Refer to Subject C.10, Infiltration/Exfiltration Measures, in this Section.

GROUND COVER

All dirt floors must be covered with a minimum six mil polyethylene film held in place with rocks, boards, earth, or sand. If it is necessary to use more than one piece, overlap joints, be sure to have at least a 12-inch overlap, weighted down. Ground cover should also extend up foundation walls approximately six inches and should be weighted down around the outside perimeter.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.7
	Date Issued: November 2002		
Subject: Standards and Specifications Foundation Ventilation	**Supersedes:** June 1999		
	Page 1		

7. FOUNDATION VENTILATION

Whenever floor insulation is provided, adequate ventilation must be included to ensure the effectiveness of the insulation and guard against deterioration caused by moisture accumulation. In the case of perimeter insulation, ventilation is optional, the need for ventilation would be determined by moisture conditions in the foundation area.

VENTILATION REQUIREMENT (FORMULA)—FLOOR INSULATION

All unheated foundation areas below floor insulation should be provided with ventilation to a minimum net free ventilation area of one square foot per 1500 square feet of floor area (Rule of thumb — 1 square inch of vent / 10 square feet of floor).

VENTILATION OPTIONAL—PERIMETER INSULATION

Ventilation would not normally be used when the foundation perimeter is being insulated. Do not cover existing vent openings, but ensure that there is a means of closing the openings during the heating season. Inoperative vents should be replaced with operable vents. New operative vents may be installed in areas which may be subject to moisture problems during the non-heating months. Note: In cases where ventilation exists or is added to heated foundation areas, the client should be instructed to close the vents during the heating season.

VENT PLACEMENT STANDARDS AND REQUIREMENTS

When ventilation is being added, it should be placed so as to eliminate still air pockets in the foundation areas being addressed. This can be accomplished by providing separate vents to isolated areas and placing vents to allow for cross-ventilation, whenever possible.

Vents for areas to be completed with perimeter insulation must be closeable.

All ventilators shall be installed in accordance with the manufacturer's recommendations. Vent openings must be a minimum of 1/8" and may not exceed 1/4". Vents should be installed clear of obstructions.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.8
	Date Issued: November 2002		
Subject: Standards and Specifications Furnace/Boiler/Space Heater Replacement	**Supersedes:** June 1999		
	Page 1		

8. FURNACE/BOILER/SPACE HEATER REPLACEMENT

When called for by the NEAT audit (see Section I.B of this Chapter), new furnaces, boilers or space heaters shall be installed. Also, new furnaces, boilers and space heaters may be called for as a health and safety measure if the heat exchanger is cracked (and cannot be replaced) or the unit is otherwise determined to be a health and safety hazard (the reason for replacement shall be documented in the BCJO).

When called for, new furnaces, boilers and space heaters with a minimum 80 percent AFUE shall be installed. Fuel type may be determined by the agency, with consideration of costs/savings. The output rating of all units shall be sized according to the Manual J calculations, as published by the Air Conditioning Contractors Association, or NEAT sizing may be used.

INSTALLATION

Installation must be completed by a licensed mechanical contractor. Installation shall be in accordance with the requirements of the governing code and manufacturer's recommendations and a mechanical permit shall be obtained from the responsible code enforcement authority.

Installation shall include all necessary related work as required (i.e., thermostat, combustion air intake, exhaust ventilation). New heating appliances (including water heaters) which are to be installed on a concrete, dirt, or damp floor, should be raised a minimum of 2" above the floor surface. New hot air units which do not have a readily accessible filter access/location should have a filter rack with a cover, installed in the return air plenum, in an accessible location.

Notes:
1. All new combustion furnaces, boilers, and space heaters shall be vented to the outside.

2. A properly sized chimney liner is required for the old chimney, in cases where the new furnace, boiler, or space heater has it's own new venting system (i.e. new 90+ furnace)which leaves the water heater vented into a chimney which previously served both the water heater and furnace or if the Btus of appliances served is reduced.

SPACE HEATERS

Compliance with the DOE Space Heater Policy contained in this Section/Subject is required. Unvented space heaters may be replaced with vented space heaters. Agencies have flexibility in determining fuel type for new space heaters and should consider costs/savings in making this determination. The purchase/installation of unvented space heaters is prohibited.

DUCT SIZING

In cases where new duct work is being installed, sizing of supply and return ducts should be determined in accordance with the BTU rating of the heating unit.

Rule of Thumb: 2 square inches of duct opening per 1000 BTU/hr. output for both supplies and returns.

DOCUMENTATION REQUIREMENTS

The “All Combustion Appliances” and “Primary Heat Source” sections of the Building Check and Job Order Sheet, shall be completed by the Mechanical Contractor when furnace work is required (see Section IV.C, Combustion Appliance Inspection/Testing in this Chapter). It is required that the mechanical permit number be stated on the BCJO or a copy of the permit attached.

CERTIFICATION

Once the unit has been installed, the mechanical contractor must place a sticker on the appliance, in plain view, certifying that the system has been properly installed in accordance with governing code requirements. The sticker shall indicate the date of installation and the name and phone number of the mechanical contractor.

Department of Energy

MEMORANDUM

Date: March 18, 1992

Subject: Weatherization Assistance Program (WAP) Space Heater Policy

To: Support Office Directors, WAP Program Managers

BACKGROUND

An estimated three million low-income households in the United States rely on space heaters as their primary method of heating their homes. An additional two million low-income households use space heaters as a secondary method of heating. Many States have requested that they be allowed to repair or replace space heaters on an as needed basis, the same treatment for furnaces are given.

Potential health and safety risks associated with the use of space heaters, especially portable and unvented devices, coupled with the limited base of technical knowledge on space heaters, made it imperative that space heater operation be carefully understood prior to the development of Department of Energy (DOE) policy. Therefore, the Weatherization Assistance Programs Division commissioned a study, a copy of which was previously distributed, to provide us with information on the issue of whether to include space heaters as an allowable measure in the WAP and under what conditions and circumstances. The WAP also conducted a survey of States to collect additional information on space heater programs that already exist, which was previously provided as well.

INTRODUCTION

A draft space heater policy was transmitted to the Support Offices and the States for comment on October 18. 1991. We received many comments for which we thank everyone. These comments were taken into consideration, where possible, in determining the policy contained herein. The major concerns from States that weatherize space heater homes fall into two categories: (I) That there may be some homes occupied by WAP eligible clients where unsafe conditions exist prior to weatherization work, and (2) that weatherization air tightening techniques have improved to the point that they can create indoor air quality concerns if used in homes with space heaters when replacement or repair of such equipment is not allowed.

The space heater report that was completed for WAP pointed out a variety of areas of concern but was not able to obtain air quality data or standards that could be used to formulate a final space heater policy. The North Carolina IAQ testing, admittedly limited, provides further concerns and actual readings in the 120 homes measured in the study. The resulting policy,

therefore, attempts to take a common sense approach to the treatment of space heaters, taking into consideration the limited information and experience we have to date.

APPLICABILITY

This policy applies to gas and liquid ftieled space heaters only. Wood burning stoves were treated earlier; coal burning stoves are still under consideration. This policy applies to gas and liquid fueled space heaters whether the appliance is the primary or secondary heat source.

INCIDENTAL REPAIRS

Incidental repairs under the WAP are not affected by the policy contained herein. Agencies may continue making incidental repairs necessary to allow weatherization work to proceed safely, including to space heaters.

SPACE HEATER POLICY

Any space heater replacement or repair procedure should include inspection to ensure that a working smoke detector is installed on the same floor as the space heater. In instances where a smoke detector is not present or is not operating properly you may purchase and install one with DOE funds. The cost of the purchase and installation of the smoke detector is a material cost.

Client education, including information on the proper operation of the equipment, should be provided. Checks should be made to insure that auxiliary considerations, such as electrical wiring or chimneys, are in good condition; and, that no obvious building code violations or other safety hazards related to the space heater are evident. Installation of space heaters requires knowledge of appropriate industry standards and adherence to all aspects of the applicable building code(s) in the municipality where installation is taking place. Building permits should be secured, where required, (this is a materials cost as well) for all space heater work and final inspection by competent professionals should take place before any heater is put into operation.

We have referenced a number of documents that may be useful to the grantees in adding this component to their program. These documents found in this guidance under the heading of "Related Materials and Documents," and have either already been distributed to you and the grantees; or, as in the case of the Consumer Product Safety Commission pamphlets, being sent under separate cover.

I. Vented Space Heaters

Oil-fired space heaters (which are always vented), vented kerosene space heaters and vented gas space heaters should be treated as if they are ftrnaces. DOE is taking this approach because of the similarities with other furnaces: tune-ups are possible; the fuels burn relatively clean and free of sediment; they are relatively low in viscosity and free of ash; and there are vents and perhaps duets that can be cleaned. This policy is one that the States have recommended since furnace replacement was first allowed.

2. Unvented Space Heaters

Operation of unvented gas and liquid fueled space heaters can negatively impact indoor air quality through indoor air pollution. Indoor pollutant concentrations resulting from the use of unvented space heaters can vary sigiificantly from house to house depending on the operation of the space heater and the air infiltration/ventilation rates of the residential structure iii which it is placed. Poorly adjusted heaters produce substantially greater quantities of carbon monoxide (CO), aldehydes and particulates than properly adjusted units, while inadequate ventilation may result in a rapid buildup of all pollutants including hannful quantities of CO. Even with the IAQ testing done by North Carolina as a guide for our policy, it is still difficult to accurately predict the impact of unvented space heaters on indoor air quality. It is very important to exercise caution in the use of unvented space heaters, since the potential for accumulation of harmful pollutants is clearly evident.

In addition to the production of toxic by-products, unvented space heaters release water vapor equivalent to8 to 11 gallons of liquid water into the heated space for each million Btu of energy delivered. Water vapor condenses upon cooling to room temperature, creating a source for mold growth and contributing to premature rotting of interior building materials unless adequate ventilation is maintained.

The DOE policy on treatment of unvented space heaters is as follows. In cases where weatherization work takes place on homes with unvented space heaters, local agencies should cheek to see if a vented space heater can be installed to carry the major heating load. Otherwise the local agency should consider either replacing all the unvented heaters or not weatherizing the house with measures that decrease air infiltration. In cases where replacement is indicated, States should carefully analyze existing conditions to best determine whether to require replacement with the same fuel items. The decision to change fuel types should be on a limited, case-by-case basis.

Current WAP regulations governing weatherization activities require that measures installed in a dwelling unit be selected on the basis of cost-effectiveness, with the most cost-effective installed first. Unvented space heaters have very high efficiency ratings because they discharge their exhaust gases directly into the space being heated rather than outside, allowing the energy embodied in the hot exhaust gases to be released into the heated space. Vented space heaters exhaust combustion products, and considerable amounts of energy, out of the residence, and therefore, are far less energy efficient.

The current WAP regulations are undergoing several changes. One of these changes includes a heightened emphasis on health and safety. The replacement of an unventeci space heater with a vented one may not be justified through cost-effective methods in and of itself However, the potential does exist to combine other weatherization measures and health and safety considerations with vented space heaters as replacements for unvented space heaters. In such instances the heat energy demanded by the structure can bc lowered so that total energy costs are less or the same, while the indoor air quality resuliing from the use of a vented space heater is

greatly improved. The above considerations must be taken into account in justifying replacement of an unvented space heater with a vented one.

a. Electric Space Heaters

DOE will not permit any WAP-funded weatherization work other than incidental repairs on electric space heaters with DOE finds. (If funds from another source are available, DOE will not preclude use of such a source, but we do not encourage it.) This is because of the high cost of electricity as compared to fossil fuels; the lower output ratings (size); the risk of fire hazards - especially in older homes: and, the inadequate electrical systems in older homes frequently cannot safely carry the power required to operate an electric heater. Work on such systems may make local agencies liable for inadequate electric wiring and damages that may result.

b. Gas Space Heaters

ANSI Z223.1 contains the following prohibition against installation of unvented gas space heaters: “Unvented space heaters shall not he installed in bedrooms or bathrooms, nor shall they be installed in institutions such as homes for the aged. sanitariums, convalescent homes or orphanages.” This prohibition, coupled with the potential for serious indoor air quality and moisture problems, leads DOE to permit replacement of gas space heaters only when the existing ones are in poor mechanical condition or pose health and safety risks for other reasons. (We understand that repair is not generally an option with unvented gas space heaters.) Such replacement should be with another gas space heater. We would expect that such replacements would be with vented systems but are not requiring vents in this interim policy.

c. Kerosene Space Heaters

Because of the potential for serious indoor air quality and moisture problems, the potential fire hazards, and that the user must select the proper grade of kerosene, the DOE position on unvented kerosene space heaters is that local agencies may replace or repair unvented kerosene space heaters only if an acceptable plan is submitted to the applicable State. This plan should consider among other things: The cost-effectiveness, health and safety concerns; the code considerations. if applicable: and, a client education component. Also, such replacements or repairs should be considered only when the kerosene heaters are the only source of heat and no reasonable alternative exists.

IMPLEMENTATION

The information contained in the section entitled. “Weatherization Considerations,” and found on pages 35-38 of the space heater report should be understood and addressed by local programs that get involved in space heater repair and replacement. Grantee health and safety policy, especially as it relates to space heater repair and replacement, in compliance with the above guidance, must be explained in the applicable State plan or appropriate amendment in order to

permit Support Office review and approval. Funds to address these items as part of weatherization work will be allowable WAP costs. It is especially-important to insure that adequate inspection, safety, liability and insurance procedures exist and be followed. In ii cases, an education component for clients should be a part of the space heater work. Further, testing for indoor air quality, especially carbon monoxide levels in homes with unvented space heaters, should be performed. The cost of purchase of the testing device, the mechanical tools necessary to check for indoor air quality and the training of personnel to do the testing are allowable program expenses. These charges may be made to the program support cost category.

RELATED MATERIALS AND DOCUMENTS

August 1, 1991, transmittal of the results of the Indoor Air Quality test component of the North Carolina Audit Field Test.

Analysis of Space Heaters as a Possible Allowable Weatherization Measure (a report).

Space Heater Analysis for WAP

CONSUMER PRODUCT SAFETY COMMISSION PAMPHLETS (CPSC):

Smoke Detectors Can Save Your Life (English and Spanish versions)
What You Should Know About Space Heaters
On the Side of Safety ... CAUTION Choosing and Using Your Gas Space Heater
Product Safety Fact Sheet - No. 98: Electric Space Heaters
Product Safety Fact Sheet - No. 44: Fireplaces
Product Safety Fact Sheet - No. 79: Furnaces
Product Safety Fact Sheet - No. 99: Ground-Fault Circuit Interrupter (GFCI)
Product Safety Fact Sheet - No. 9: Ranges and Ovens
Your Home Fire Safety Checklist
What You Should Know About Combustion Appliances and Indoor Air Pollution

POLICY TRANSMITTAL TO GRANTEES

Support Offices are requested to provide copies of this interim space heater policy to their grantees and to request that grantees, in turn, provide it to subgrantees.

James Gardner, Jr., Acting Director
Weatherization Assistance Programs Division
Office of Grants Management
Conservation and Renewable Energy

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.9
	Date Issued: November 2002		
Subject: Standards and Specifications Furnace Flame Retention Burner (Oil)	**Supersedes:** June 1999		
	Page 1		

9. FURNACE FLAME RETENTION BURNER (OIL)

When called for by the NEAT audit (see Section I.B of this Chapter), oil furnaces equipped with a gun-type burner (not a vaporizing, rotary, or pot-type burner) shall receive a flame retention burner capable of hot gas recirculation and compatible with the corresponding combustion chamber width and length (per manufacturer's recommendations).

Note: A flame retention burner shall not be called for unless the oil-fired heating unit is the primary source of heat for the dwelling (supplies over 50 percent of the total heat).

PRECAUTIONS

The heating unit shall be inspected for oil leaks, boiler leaks, flue leaks, condition of the supply plenum, heat exchanger, combustion chamber, a functional emergency switch, and adequate flue draft. If problems are found relative to any of the above, or other significant problems are found, a flame retention burner shall not be installed, unless the problem is corrected. Furnaces requiring major repairs or having a short life expectancy (less than seven years) shall not be equipped with a flame retention burner, unless repairs are completed and the anticipated life of the furnace is seven years or longer.

INSTALLATION

Installation of flame retention burners must be completed by a licensed mechanical contractor and a mechanical permit shall be obtained from the responsible code enforcement authority. Existing gun-type burners shall be replaced with a flame retention burner in accordance with governing code requirements and manufacturer's recommendations. In addition, the following shall be completed as needed:

1. Complete clean out and sealing of boiler sections, fire doors, flue pipe joints, and anywhere excess air can infiltrate the combustion area or flue passages.

2. Install new primary control.

3. Draft shall be set at .02 over flame during "on" cycle.

4. Check combustion chamber, replace as necessary (a "cerefelt" liner may be used).

5. Replace draft regulator and flue pipe.

6. Replace any controls or wiring required for safe, reliable operation.

7. Replace furnace filter.

Upon installation, furnaces receiving a flame retention burner must meet the following requirements:

1. An oxygen (O_2) reading of 7 percent or less or a carbon dioxide (CO_2) reading of 11 percent or greater.

2. A maximum smoke of "1".

3. An efficiency rating of 80 percent or greater.

DOCUMENTATION REQUIREMENTS

When oil fired flame retention burners are installed the "All Combustion Appliances" and "Primary Heat Source" sections of the Building Check and Job Order Sheet shall be completed by the mechanical contractor (see Section IV.C, Combustion Appliance Inspection/Testing in this Chapter). The mechanical permit number should be stated on the BCJO or a copy of the permit attached.

CERTIFICATION

Once the unit has been installed, the mechanical contractor must place a sticker on the appliance, in plain view, certifying that the burner has been properly installed in accordance with governing code requirements. The sticker shall indicate the date of installation and the name and phone number of the mechanical contractor.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.10
	Date Issued: November 2002		
Subject: Standards and Specifications Infiltration/Exfiltration Measures	**Supersedes:** January 1997		
	Page 1		

10. INFILTRATION/EXFILTRATION MEASURES

Infiltration/exfiltration shall be addressed to the extent dictated by blower door testing.

The infiltration/exfiltration measures will be considered fulfilled if (1) blower door calculations are completed to show the dwelling is at the minimum air change level for occupant safety conditions, or (2) the initial air change level is reduced by an appropriate percentage (NOTE: for Items 1 and 2, see guidelines in Section IV.A, Blower Door Testing, in this chapter).

BLOWER DOOR TESTING

Blower door testing shall be utilized to identify leakage sites and determine the infiltration/exfiltration work needs/extent (see Section IV.A, Blower Door Testing, in this chapter and Chapter III., Blower Door Test Requirements).

MAJOR BYPASSES

Major bypasses are considered mandatory weatherization measures (see Subject B in this Section) and shall be addressed in accordance with the requirements of this subject.

Major bypasses as determined by blower door testing are generally defined as openings/direct penetrations through the interior between heated and unheated areas of ½ inch or greater if in the pressure planes (foundation areas/ceiling and within three feet of the ceiling) and other specific large openings into other heated areas (from unheated areas) which may be subject to leakage (i.e., broken glass, missing or broken windows and doors, open dryer vents). Examples of ½ inch gaps in the pressure planes that generally should be addressed:

Access Openings
Mechanical Penetrations
Fireplace Damper
Balloon Frame Construction
Kneewall Floors

AREAS TO CHECK FOR LEAKAGE

Following is an outline of areas which shall be examined for leakage during blower door testing:

A. Potential Ceiling Bypasses (for ceilings between heated rooms and unheated areas)

1. Holes in ceiling covering
2. Wall cavities opening into the attic/balloon frame construction
3. Gaps at plumbing, electrical, and mechanical penetrations

4. Drops in ceiling (i.e., soffits)

5. Closing off fireplaces (if there is no damper or a poorly fitting damper and no other means of closure).

6. Attic access door

7. Gaps at attic access

8. Balloon frame construction

B. Potential Sidewall Bypasses (for walls between heated rooms and unheated areas)

1. Pulley openings on double hung windows

2. Gaps in foundation wall and around basement windows

3. Permanent air conditioners (jacket and air sealing)

4. Ill fitting windows, doors, and storms

5. Broken glass

6. Wall penetrations

7. Cores of blocks opening into heated (living) areas

8. Gaps at sill plate in heated living areas

9. Areas where different materials meet (i.e., masonry to frame, foundation to siding)

10. Wall access/openings between heated and unheated areas

11. Gaps at wall access

Note: In sealing areas adjacent to combustion furnaces and water heaters, attention shall be given to providing adequate combustion air (i.e., not sealing bypasses in the vicinity of these appliances, providing ducting for exterior combustion air as an "incidental repair").

C. Potential Floor Bypasses (for floors between heated areas and unheated areas)

a. Gaps at plumbing, electrical, and mechanical penetrations

b. Wall cavities opening into foundation area

c. Holes in floor

d. Floor access door

e. Gaps at floor access.

D. Closing Off Areas

Portions of the home which are not being used as living areas in the winter should be evaluated for potential measures to separate them from areas which require heat.

Note: Consult with the client/homeowner on unused heated areas of the home that could be sealed off (and thereby made unheated to conserve energy).

METHODS OF ADDRESSING INFILTRATION/EXFILTRATION

GENERAL INSTRUCTIONS

Areas of infiltration/exfiltration which exist between heated living areas and unheated areas must be addressed unless determined otherwise by blower door testing. These areas should be addressed utilizing the below-specified methods as needed to address the sources of infiltration/exfiltration. All old ineffective materials (i.e., deteriorated, damaged, wet) should be removed and replaced as needed.

Note: Infiltration/exfiltration problems require correction in all cases (unless determined otherwise by blower door testing), regardless of whether the area is insulated or will be insulated as part of the weatherization work.

CAULKING

Caulking can be utilized to address areas of infiltration/exfiltration, as well as to eliminate moisture penetration.

Joints and spaces to be caulked shall be clean, free from dust, and dry. Types and color of caulk used should be compatible with adjacent structure. Openings wider than 1/4 inch should be stuffed prior to caulk application. Caulking shall be applied in accordance with manufacturer's recommendations.

Apply sealant with a gun or knife as required to fill all voids and joints. Sealant should form a continuous adhesion to (overlapping) surfaces joined (without gaps). Neatly finish and remove excess caulking and leave surface neat and smooth.

Immediately following caulking application, clean all adjacent surfaces which have been soiled and leave work in a neat and clean manner.

Notes: In areas of infiltration/exfiltration which may be subject to high temperatures (i.e., around chimneys), appropriate materials should be utilized which will withstand the potential temperatures, so as not to create a hazardous situation.

WEATHERSTRIPPING

Various types of weatherstripping can be utilized for doors, windows, and access openings between heated and unheated areas where infiltration/exfiltration exists.

Appropriate types of weatherstripping should be utilized to allow for proper operation and create an effective opening seal. A pressure fit foam or felt type weatherstripping would be allowable for low use access openings only. Weatherstripping exposed to the sun shall be of UV resistant materials. All weatherstripping shall be installed in compliance with manufacturer's recommendations.

A pressure fit type of weatherstripping for windows would only be allowed at the head jamb and sill. Side jambs and meeting rail weatherstripping must be of a type which will allow for, and remain effective under, opening and closing operations.

When used, metal "V" type weatherstripping should be installed in a manner so that the opening of the "V" faces toward the outside so that infiltrating air will force a tighter seal.

All weatherstripping shall be fastened securely, screws of aluminum, stainless steel, or other noncorrosive materials compatible with aluminum or vinyl are recommended where applicable. Fasteners are required within 2" of the ends for each piece of weatherstripping.

Notes: Some types of weatherstripping require caulking where they are attached. This should be completed in accordance with the "Caulking" section. If the upper sash is stationary, it can be caulked closed with the owner's approval and not be weatherstripped.

DOORSWEEPS

Doorsweeps can be utilized where appropriate to address infiltration/exfiltration at door bottoms. Door sweeps shall be of sufficient free play to accommodate door operation. This material shall be fastened securely to the (swing side face) bottom of the door. Fasteners are required within 2" of the ends of the doorsweep. Doorsweeps can only be used where they come in final contact with a solid surface (i.e. wood or metal sills, concrete, etc.), carpeting is not a solid surface.

THRESHOLDS

Thresholds can be utilized where appropriate to address infiltration/exfiltration at door bottoms. Wood door thresholds shall be oak or treated lumber. Caulk as necessary. Metal thresholds shall be of noncorrosive metal or aluminum, water return type, with integral weatherstripping and shall fit weather tight with door. Caulk metal threshold at exterior edge as needed. A good existing metal threshold requiring new vinyl weatherstripping should be provided with a new vinyl strip.

GLASS REPAIR/REPLACEMENT

Broken glass should be replaced in prime windows, prime doors, and storm windows which serve heated areas (also storm doors if the prime door is wood). Minor chips and cracks in glass need not be corrected, provided the glass is tight and intact. In cases where glass is tight and intact but a gap does exist, the glass should be patched with a glass patch or glass tape. All replacement glass shall be bedded in caulking or glazing compound, secured with push points, and glazed on the exterior side.

Note: Replacement glass must be in compliance with the governing code (i.e., safety glazing in doors and any glass panel located within 24 inches of a door).

GLAZING COMPOUND REPLACEMENT

Reglazing shall be done on prime windows, prime doors, and storm windows which serve heated areas if more than 50 percent of the existing glazing is missing or ineffective. Also, in cases where the glass is loose, push points, exterior glazing, and interior caulking (to bed the glass) would be required.

PRIME DOOR REPAIR/REPLACEMENT

Various repairs can be completed on prime doors to eliminate infiltration/exfiltration (i.e., "L" brackets, tighten hinges, adjust lock, plexiglass). Prime door replacement shall be done only in cases where the existing door cannot be repaired/sealed to adequately address leakage. New doors should be 1 3/4" thick wood or metal, except if only the door is being replaced, a door of equal thickness to the door being replaced can be used. An exterior grade door shall be utilized where there is exposure to the weather. New doors should be installed in a weather tight and serviceable manner to operate properly, complete with lock, weatherstripping, and hardware. Prehung doors are allowable. New doors can be (optional) equipped with a peephole or door lite (maximum 10" x 10"). Interior doors may be utilized to separate heated from unheated spaces within the home interior (i.e., attic doors).

PRIME WINDOW REPAIR/REPLACEMENT

Various repairs can be completed on prime windows to eliminate infiltration/exfiltration (i.e., adjust lock, adjust stops). Prime window replacement shall be done only in cases where the existing prime window cannot be repaired/sealed to adequately address leakage. In limited cases, when determined to be cost effective, a storm window may be added to a poor existing prime window as an alternative to a replacement window. Replacement windows should be installed in a weather tight and serviceable manner to operate properly, complete with necessary lock, weatherstripping, hardware, and trim. Replacement windows should generally be sized to match the windows being replaced.

Note: Caution should be taken to assure replacement windows satisfy the emergency egress requirements of the governing code.

WINDOW SASH REPAIR/REPLACEMENT

Various repairs can be completed on window sash to eliminate infiltration/exfiltration (i.e, "L" brackets, tension springs, planing). Individual window sash which cannot be effectively repaired/sealed to adequately address leakage can be replaced. New sash should be installed in a weather tight and serviceable manner to operate properly, complete with appropriate hardware (handles are optional).

SASH CHANNELS REPAIR/REPLACEMENT

Stops and jambs forming the sash channels can be adjusted, repaired, or replaced, as necessary, to address infiltration/exfiltration around window sash. In the event that repair of the window jamb or stops is not feasible, installation of sash channels is acceptable. Sash channels shall be of one piece extruded aluminum or vinyl material forming an integral jamb and stop assembly, inserted and fastened (following removal of old stops) through the existing jamb and into secure existing framing for the jamb. Channels shall be installed with screws of aluminum, stainless steel, or other noncorrosive materials compatible with aluminum or vinyl. Any resulting gaps between the existing jamb and new channel shall be caulked or otherwise filled in accordance with the other "Methods of Addressing Infiltration/exfiltration" contained in this section/subject.

SEALING PULLEY OPENING

For operable pulleys on double hung windows, pulley seals with an integral vinyl weatherstripping should be provided to allow for sash operation and to lessen infiltration/exfiltration. Inoperable pulleys may be otherwise sealed in accordance with the other "Methods of Addressing Infiltration/exfiltration" contained in this section/subject or pulley seals may be installed with the openings caulked shut.

STORM DOOR REPAIRS

Necessary repairs and adjustments shall be completed on storm doors which would serve to protect wood prime doors to address infiltration/exfiltration (except if the cost of repairs would approach the value of the storm or if conditions are such that the storm cannot be effectively repaired). Various "Methods of Addressing Infiltration/exfiltration" contained in this section/subject are allowed for storm doors (i.e., Glass Repair/Replacement, Glazing Compound, Replacement Locks, Hardware, and Fasteners). Storm doors which serve a steel prime door may be repaired at the agency's option.

STORM WINDOW REPAIRS

Necessary repairs and adjustments shall be completed on storm windows (wood, vinyl, and aluminum) to address infiltration/exfiltration (except if conditions are such that the cost of repairs would approach the value of the storm). Various "Methods of Addressing Infiltration/exfiltration" contained in this section/subject are allowed for storm windows (i.e., Glass Repair/Replacement and Locks, Hardware, and Fasteners).

LOCKS, HARDWARE, AND FASTENERS

Appropriate types of locks, hardware (i.e., hinges, cranks), and fasteners (i.e., screws, nails, rivets) shall be utilized, as required, to complete weatherization measures and as a means of addressing infiltration/exfiltration. If possible, existing locks and hardware should be reused (repaired or adjusted, as necessary). New locks, hardware, and fasteners shall be provided when required, which are appropriate for the given locations (i.e., to match similar items existing; proper size; brass, aluminum, or galvanized for exterior applications where rusting could be a problem; keyed lock sets for exterior doors; and passage lock sets for attic stair doors). Locks and hardware should be properly installed so as to allow for proper operation of doors and windows and to provide secure closure. Three 3 ½" hinges are required for entry doors. Hinges for entry doors which swing out shall have a setscrew in the barrel to prevent the removal of the pin when the door is closed. Other required hardware (i.e., strike plates, sash guides, cranks) shall be provided as needed.

WOOD TRIM REPAIR/REPLACEMENT

Wood trim (i.e., jambs, headers, sills, stops, casings, moldings) shall be secured, adjusted, or replaced, as needed, in order to eliminate infiltration/exfiltration. Appropriate fasteners shall be added, as needed, to properly secure loose trim. If necessary, existing trim can be removed and replaced or otherwise adjusted for a better fit. Damaged or missing trim causing infiltration/exfiltration shall be replaced with material which matches, as closely as possible, the existing construction. "Dutching" is allowable if completed in a professional manner.

STUFFING, BLOCKING, AND COVERING

Various materials capable of stopping air flow can be utilized, as needed, for stuffing, blocking, or covering sources of infiltration/exfiltration.

Stuffing may be required to prepare larger gaps for caulking, or as a corrective measure by itself (i.e., around pipes, at the sill plate). Various products may be utilized which are compatible with adjacent materials and do not create a fire hazard or other problems (i.e., foams, rope caulk, backer rod, fiberglass).

Doors, windows, and other openings not required as a means of egress or for ventilation can be blocked with the owner's approval. When possible, such openings shall be insulated prior to blocking (i.e., an unneeded door could be blocked by first insulating the door opening with fiberglass batts, then applying a covering such as plywood, paneling, or drywall, caulked in place to seal the opening). Other types of openings between heated and unheated areas (i.e., holes in foundation walls, drops at kitchen soffits, wall cavities in balloon framed homes, floor cavities below insulated kneewalls, plumbing and wiring chases, gaps around chimneys) shall be blocked using appropriate materials for the location (i.e., sheet metal and high temperature caulk around chimney).
Various types of ceiling, wall, and floor coverings can be utilized where required to address infiltration/exfiltration (i.e., plaster, drywall,

paneling). Materials shall be applied with appropriate fasteners and finished as required (i.e., drywall taped and finished). Surfaces shall be properly prepared prior to covering by removing, as necessary, old materials and installing lath, backing, shims, furring, etc., as needed. Where locations/codes dictate fireproof or moisture proof coverings, appropriate materials shall be utilized.

Note: Caution should be taken not to apply coverings which would entrap moisture in closed cavities (i.e., roll roofing should not be used as an exterior covering over a full wall cavity, this would not allow for moisture to escape).

AIR CONDITIONER INFILTRATION MEASURES

Permanently set air conditioners shall be closed off with an air conditioner jacket in heating seasons. Air conditioner jackets shall be provided to the client in non-heating seasons. Jackets shall be sized to fit air conditioner units. Other appropriate measures shall be taken to address infiltration/exfiltration around air conditioners.

CLOSING OFF FIREPLACES

Unused fireplaces with no damper or a poorly fitting damper and no other means of closing shall be closed off to stop infiltration/exfiltration. Various methods of blocking the chimney or fireplace opening will be accepted. Blocking shall not be of a permanent nature (should be removable). If blocking is not readily visible, it should be flagged (i.e., red tagged, noting blocking).

Fireplaces which are used which cannot be effectively closed off by the damper, fireplace doors or other means, shall be repaired or otherwise corrected to allow closure when not in use.

CLOSING OFF AREAS

Portions of homes not necessary for any client use which would require heat shall be closed off to the maximum extent possible (and as is acceptable to the client/owner). Such areas may include individual rooms, certain areas within the house (i.e., kneewall and crawl space areas), or even complete floors.

New interior doors may be installed where none exist in order to separate heated from unheated areas. Interior doors to unheated areas may be weatherstripped (including door bottom) and insulation batts or blankets (minimum R11) may be applied to the back side of such doors (vapor barrier on door/heated side). Insulation applied to doors should be covered with a six mil polyethylene film stapled in place and sliced (cut) in random locations so as not to entrap moisture. Interior walls between heated and unheated areas can be insulated in accordance with Subject C.14, Wall Insulation, in this section.

Unused, unheated second and third floor areas may be closed off by insulating floor-ceiling areas between heated and unheated floors. In such cases, appropriate attic preparation and ventilation is required. (Refer to Subject C.1, Attic Insulation, and C.2, Attic Ventilation, in this section.)

Various "Methods of Addressing Infiltration/exfiltration" contained in this section/subject and the various insulation subjects in this section may apply in completing this measure.

Note: When areas are closed off, heat entering these areas must also be stopped (addressed by appropriate means, i.e., closing registers, dampers, valves).

Access openings between heated and unheated areas shall be addressed as follows:

Ceiling Access: All ceiling access doors to unheated attic areas from heated areas must be weatherstripped and insulated to a minimum R19. Permanent barriers are required to allow for full depth of insulation to be applied around such openings.

New covers shall be A-D type interior plywood (minimum ½ inch thick). Cover shall be lay-in type. Rough opening (minimum size of 14½ x 24 with proper framing methods meeting local codes) shall be enclosed to totally support finish trim and cover. Finish trim shall be similar to door casing with mitered corners when exposed to living areas.

Kneewall Access: All kneewall access doors between heated and unheated areas must be insulated (minimum R11) and weatherstripped. If an access door is to be installed, it shall be A-D interior type plywood (minimum ½ inch thick). The door opening shall be framed and cover hinged with a barrel bolt or otherwise attached so as to be easily removable for access/inspection and prevent warpage.

Walk-Up Stairs: Where attic areas are not being used to any extent (with the client/owner approval), covers can be provided to cap the stairwell opening. Covers shall be cut from a minimum ½ inch plywood and shall be hinged and insulated to a minimum R19 with batt or blanket insulation. It may also be necessary to weatherstrip the cover.

Where simple access is necessary (i.e., elderly client or high-use area), the area shall be weatherized by weatherstripping and insulating (minimum R11) the stairwell door. Insulation shall be applied between heated and unheated areas (walls of stairwell adjoining heated rooms and under the stairs, if appropriate/possible).

Floor Access: All floor access doors from heated areas to unheated foundation areas must be weatherstripped and insulated to the level determined by the NEAT audit for floor insulation (minimum R11).

Foundation Wall Access/Openings: Access doors between heated foundation areas and unheated areas shall be fully weatherstripped and insulated to a minimum R10. Where openings exist between heated foundation areas and unheated areas, they shall be closed-off/sealed by appropriate means (i.e., repairs such as masonry or framing, or construction of access doors of a minimum ½ inch plywood).

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.10
	Date Issued: November 2002		
Subject: Standards and Specifications Infiltration/Exfiltration Measures	**Supersedes:** January 1997		
	Page 10		

SEALING NEW WOOD/WEATHERIZATION MATERIALS

Any wood, glazing, and other materials which the manufacturer recommends be sealed that is used to complete weatherization which is exposed to moisture, shall receive a minimum of prime painting or other recommended sealer in accordance with manufacturer's recommendations.

Wood and similar materials requiring a sealer shall be so protected whenever moisture may affect these materials. This includes all new wood doors and sash even when they may be protected by a storm. It is critical that the front, back, and all four edges of a wood door or sash receive a good seal to prevent warpage.

Note: If the owner has requested to be allowed to paint or otherwise seal such materials, this shall be properly documented with the owner's signature and maintained in the client/job file. Also, in such cases, the agency shall instruct the owner regarding how to properly seal (i.e., be sure all four edges and two faces of doors are sealed).

DECAY RESISTANT WOOD REQUIREMENTS

Pressure treated or other approved decay-resistant wood shall be used for any wood within 8" of exposed earth.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.11
	Date Issued: November 2002		
Subject: Standards and Specifications Smoke Detector	**Supersedes:** January 1997		
	Page 1		

11. SMOKE DETECTOR

Smoke detectors are required as a health and safety measure (see Section III.H, Health and Safety Measures, in this chapter). New alkaline batteries shall be provided for existing smoke detectors in need of batteries.

SPECIFICATIONS

Smoke detectors shall be battery (alkaline) powered, approved, and listed by an independent testing lab (i.e., UL).

INSTALLATION

A smoke detector is required outside each bedroom area (i.e., in the hall/room leading to the bedrooms; if there are bedrooms located in separate areas of the home, a smoke detector shall be located in the hall/room leading to each separate bedroom area) and on each additional story of the dwelling (including basements and cellars but not including crawl spaces and uninhabitable attics). Smoke detectors shall be installed in accordance with the manufacturer's recommendations.

INSTRUCTIONS TO CLIENT

Clients shall be instructed on testing procedures for smoke detectors and replacement of the batteries.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.12
	Date Issued: November 2002		
Subject: Standards and Specifications Storm Windows	**Supersedes:** January 1997		
	Page 1		

12. STORM WINDOWS

When called for by the NEAT audit (see Section I.B. of this chapter), storm windows shall be installed over existing single-glazed prime windows. Storm windows shall be compatible with the operation of prime windows (i.e., double-hung storms for double hung primes, and insider storms for out-swinging primes) and correctly aligned. Exterior self-storing combination storm/screen windows are preferred where applicable. In cases where such storms will not work, alternative storm window treatments which meet the standards contained in Chapter III, Minimum Standards for Wx Materials, may be utilized.

Note: Prime windows with double glazing (or more) or already equipped with functional storm windows are not eligible for new storm windows.

SPECIFICATIONS

Various types of storm windows (i.e., aluminum, vinyl, or wood frame) are acceptable based on compliance with DOE/WAP Appendix A (see Chapter III., Section IV.A.1, Minimum Standards for Wx Materials) and governing code requirements.

INSTALLATION

Storm windows shall be securely attached to window frame/trim with noncorrosive fasteners. If frame is not structurally sound or not flush, it shall be corrected prior to installation of the storm. A minimum 3/4" to a maximum 4" airspace shall be maintained between prime window and storm (in cases where storms must be mounted to sash, a minimum ½ inch air space shall be provided and windows shall be sealed). All new storms shall be sealed to prevent moisture and air infiltration.

Note: Exterior storm windows shall be provided with weep holes at the bottom to prevent moisture accumulation on the sill.

Storm windows must meet the applicable building code requirements relative to egress (installed storms shall not restrict open area of bedroom egress window) and glazing (i.e., a storm window within 24 inches of a door must have safety glazing). Operative prime windows shall remain operable without removal of storm window frame.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.13
	Date Issued: November 2002		
Subject: Standards and Specifications Venting Clothes Dryers	**Supersedes:** June 1999		
	Page 1		

13. VENTING CLOTHES DRYERS

Where possible, clothes dryers shall be vented directly to the exterior as a health and safety measure (see Section III.H, Health and Safety Measures, in this Chapter).

Clothes dryers should be vented using aluminum or galvanized sheet metal, or a test lab labeled aluminum flex duct (UL labeled “Clothes Dryer Transition Duct”, maximum distance of eight feet). A high quality foil tape or approved clamps should be utilized to secure the vent. Venting should not be fastened with screws or rivets. The vent cap shall be equipped with a back draft damper of good quality (single damper preferred). All such vents shall be air sealed and checked for proper operation.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	C.14
	Date Issued: November 2002		
Subject: Standards and Specifications Wall Insulation	**Supersedes:** January 1997		
	Page 1		

14. WALL INSULATION

When called for by the NEAT audit or the Measures Priorities (see Section I.B. of this chapter), walls between heated and unheated areas shall be insulated.

INSULATION LEVELS

For closed wall cavities, insulation shall be blown to a high density to fill the complete cavity between heated and unheated areas. Open wall cavities shall be insulated to a minimum R11.

PRECAUTIONS AND WALL PREPARATION REQUIREMENTS

A thorough interior and exterior inspection of walls to be insulated shall be completed to identify problem areas and work to be completed prior to insulation. If moisture problems are not corrected, walls should not be insulated.

Do not fill wall cavities which serve as air ducts for heating, ventilating, and/or cooling. Such cavities shall be checked and blocked where possible so that portions not required for air distribution can be insulated.

Walls appearing too weak to withstand pressures created by blowing should not be insulated unless corrections are made. Any openings in the wall must be properly blocked (air-sealed on heated side) before insulating.

Note: Prior to insulation, all by-passes shall be air-sealed (i.e., wall penetrations, balloon frame construction). Refer to Subject C.10, Infiltration/Exfiltration Measures, in this section.

Any evidence of problems with wiring in the wall cavities to be blown should be inspected and corrected by a licensed electrician, otherwise insulation should not be installed.

If knob and tube wiring exists in wall cavities to be insulated, it must be in good condition and breakers or "S" type fuses must be installed in the fuse box (15 amp fuses for #14 wire/20 amp fuses for #12 wire), otherwise such wall cavities should not be insulated.

Note: Insulating over knob and tube wiring is prohibited in some areas by code. See Section III.G, Wiring, in this chapter.

WALL INSULATION APPLICATION

Install all insulation material in accordance with the requirements of the governing code and the manufacturer's recommendations, and keep it dry and free of extraneous materials. Make entry holes in walls (if required) in such a way as to permit the complete filling of all cavities. Unless tubing is used, for good density holes shall be drilled 18 to 30 inches from the top and bottom plate so that insulation

will not be blown more than three feet (maximum of five feet between holes).

To achieve proper density, normally a two-hole method per floor, or tubing would be required.

Check the wall cavities for fire stops and other obstructions which will necessitate additional entry holes to assure complete filling of the cavity.

Wall cavities shall be filled completely, in accordance with the insulation manufacturer's recommendations on air pressure and density for sidewalls.

Close all entry holes in a workmanlike manner using material compatible with the original materials. Do not close entry holes in sheathing which is covered by an exterior brick veneer or siding.

Where wall cavities are open from the interior, blanket or batt insulation (minimum R11) may be installed. Insulation should be installed securely in the stud space to fill all voids. Insulation should not be compressed and if a vapor barrier exists, it should be on the warm (heated) side. Wall coverings/exposed insulation utilized must meet the requirements of the governing code.

Note: Insulation left exposed to the interior shall have a flame spread classification not to exceed 150.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	D
	Date Issued: November 2002		
Subject: Electric Base Load Measures Standards and Specifications	**Supersedes:** NA		
	Page 1		

D. ELECTRIC BASE LOAD MEASURES STANDARDS AND SPECIFICATIONS

Standards and specifications pertaining to Electric Base Load Measures are contained in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	D.1
	Date Issued: November 2002		
Subject: Electric Base Load Measures Compact Fluorescent Light Bulbs	**Supersedes:** NA		
	Page 1		

1. COMPACT FLUORESCENT LIGHT BULBS

When called for by the NEAT audit or the measures priorities (see Section I.B. of this chapter) incandescent bulbs can be replaced with compact fluorescent light bulbs (CFL).

The Wx inspector shall survey the home to determine the potential incandescent light bulbs to be replaced with CFLs. The target areas would be the kitchen, bathroom vanity area, reading lamps, and heavy traffic areas (i.e., living room, hallway, or protected outdoor light). All CFLs would be installed according to the manufacturers instructions.

The client should be questioned as to the average length of time the target lights are on each day. Lights which are on more than three hours per day may be replaced.

LWOs may call for replacement of up to eight (8) bulbs per household, taking into consideration the client's lifestyle.

The replacement wattage would be determined by the usage and suitability for the client. Refer to product box for wattage equivalents (i.e., a 15 watt CFL is generally equivalent to a 60 watt incandescent bulb).

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	D.2
	Date Issued: November 2002		
Subject: Electric Base Load Measures Refrigerator Replacement	**Supersedes:** NA		
	Page 1		

2. REFRIGERATORS

When called for by an audit Savings to Investment Ratio (SIR) of 1.5 or greater, the existing refrigerator(s) may be replaced with one that meets or exceeds the 2001 federal energy standards. The audit can be accomplished by using DOE approved methods, which include a NEAT (version 7.1.3) evaluation or the "Refrigerator Energy Data and Analysis Tool" (developed by D&R International, LTD).

In addition to audit required replacements, malfunctioning refrigerators will be replaced for the following documented (on the BCJO) reasons:

- Inoperable.
- Continuously running compressor.
- Unable to maintain safe food storage temperature (temperatures of refrigerator and freezer compartment will be checked during the inspection).

Note: The replacement of only one refrigerator is allowed. Households which utilize more than one refrigerator and/or freezer should be encouraged to eliminate additional units. Costs of disposal/recycling all units are allowable.

A minimum of 10% of the units evaluated will be subject to live metering to determine actual watt-hour consumption. The minimum duration for metering is two (2) hours (120 minutes). If it is determined that a defrost cycle has occurred during the metering interval, one of the following will be required:

- The metering interval should be extended to 24 hours.
- The data should be discarded, the meter reset and the two (2) hour interval begun again.

Note: If possible, the refrigerator's defrost timer should be reset by rotating through the defrost cycle to assure a "defrost-cycle free" metering interval.

REPLACEMENT REFRIGERATOR SPECIFICATIONS

All new refrigerator replacements must include the following features:

- White in color
- Freezer on top
- Auto defrost
- Standard shelving
- No ice maker
- No water dispenser

- Reversible doors
- Easy-roll wheels
- Up front controls

Note: Clients will not be allowed to make any substitutes or add-ons to the above features.

With the exception of refrigerators meeting Americans with Disabilities Act (ADA) requirements when required, only three sizes of refrigerators will be allowed. Those sizes are 15 Cubic Feet (CF), 18 CF and 21 CF. Slight variations from these sizes will be allowed.

All new replacement refrigerators must have a fifteen (15) year expected life. The warranty on all replacement refrigerators must meet or exceed a one (1) year full warranty on parts & labor and a minimum five (5) year warranty on the compressor.

All replacement refrigerators must meet or exceed 2001 Federal Energy Standards.

Sizing of the replacement unit, barring other physical constraints, should be based on dwelling unit and family size, allowing local flexibility within available models for extenuating circumstances:

- 15 CF unit for one (1) to two (2) bedroom units with up to three (3) residents.

- 18 CF unit for three (3) bedrooms with up to five (5) residents (or two [2] bedrooms with four [4]residents).

- 21 CF for units with four (4) or more bedrooms or five (5) or more residents.

Note: An upgrade in size is allowed based on family need when replacing multiple appliances with one in a housing unit where the client agrees to give up more than one appliance.

DISPOSAL REQUIREMENTS

Disposal requirements will include, removing the existing appliance(s) identified for replacement from the client's home and certified destruction (including recapture of CFC's as required by section 608 of the "Clean Air Act", as amended by Final Rule, 40 CFR 82, May 14, 1993).

Notes: A Certificate of Disposal from the scrap yard/recycler shall be available for all appliances removed from service.

If the appliance(s) identified for replacement are not available/present at the time of delivery the new refrigerator shall not be delivered. This should be documented on the BCJO and the refrigerator replacement shall be eliminated as a Wx measure for this dwelling unit.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	D.3
	Date Issued: November 2002		
Subject: Electric Base Load Measures Water Heaters	**Supersedes:** NA		
	Page 1		

3. WATER HEATERS

Inspection of water heaters should be completed in compliance with Section IV.C of this Chapter. New water heaters may be installed when called for as a "HEALTH AND SAFETY" measure. New water heaters will generally utilize the same type fuel as is currently being used. Agencies may change fuel type if it is determined as merited based on cost/savings considerations.

INSTALLATION

Water heaters shall be installed by a licensed mechanical contractor in accordance with the manufacturer's recommendations and the requirements of the governing code. A mechanical permit shall be obtained from the responsible code enforcement authority.

Installation shall include all necessary related work as required (i.e. fuel lines, exhaust ventilation). New water heaters which are to be installed on a concrete, dirt, or damp floor, should be raised a minimum of 2" above the floor surface. If the water heater is to be located in an area where combustible fumes may collect (i.e. garge), they shall be raised 18" above the floor.

Note: 18 inch stands for water heaters are commercially available.

A temperature/pressure relief valve shall be installed so that the sensor is inside the tank (not inside a pipe) and the iron/copper discharge pipe shall to be within two to six (6) inches of the floor.

Note: Poly Vinyl Chloride (PVC) is not allowable for use as a discharge pipe.

For gas fueled water heaters, the gas supply pipe needs a shut off valve before the union and a sediment trap on the gas pipe prior to the gas valve entry.

All combustion type water heaters must be vented to the outside. The vent connector needs to have a minimum 1/4 inch rise per foot. Venting for new water heaters shall be sized in accordance with the applicable NFPA code.

Note: A properly sized chimney liner is required in cases where the new water heater is being vented into a chimney which previously served both the water heater and furnace, but the furnace is now otherwise vented (i.e. new 90+ furnace).

DOCUMENTATION REQUIREMENTS

The "All Combustion Appliances" section of the Building Check and Job Order Sheet, shall be completed by the Mechanical Contractor when water

heater work is required (see Section IV.C, Combustion Appliance Inspection/Testing in this Chapter). It is required that the mechanical permit number be stated on the BCJO or a copy of the permit attached.

CERTIFICATION

Once the unit has been installed, the mechanical contractor must place a sticker on the appliance, in plain view, certifying that the system has been properly installed in accordance with governing code requirements. The sticker shall indicate the date of installation and the name and phone number of the mechanical contractor.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	E
	Date Issued: November 2002		
Subject: Optional Weatherization Measures Standards and Specifications	**Supersedes:** January 1997		
	Page 1		

E. OPTIONAL WEATHERIZATION MEASURES STANDARDS AND SPECIFICATIONS

Standards and specifications pertaining to Optional Weatherization Measures are contained in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	E.1
	Date Issued: November 2002		
Subject: Optional Weatherization Measures Low Flow Shower Head	**Supersedes:** January 1997		
	Page 1		

1. LOW FLOW SHOWER HEAD

All existing shower heads shall be examined for flow rate. When called for as an Optional Weatherization Measure (see Section I.B. of this Chapter) shower heads exceeding the below specifications shall be replaced with low flow shower heads.

SPECIFICATIONS

Shower head shall be constructed of brass or other suitable materials to provide flow at a maximum two-and-one-half gallons per minute at normal residential water pressures (20-40 psi). Head must be able to withstand temperatures of 160 degrees F.

INSTALLATION

Shower head and any necessary adapters shall be installed according to the manufacturer's instructions. Threads shall be properly sealed to prevent leaks. The old shower head should be left with the client.

Note: If the installer finds that installation is not possible, or is likely to cause problems with the existing plumbing, problems shall be documented on the Building Check and Job Order Sheet and this item shall be deleted.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	E.2
	Date Issued: November 2002		
Subject: Optional Weatherization Measures Water Heater Insulation	**Supersedes:** January 1997		
	Page 1		

2. WATER HEATER INSULATION

INSULATION LEVEL

Install insulation on water heater and pipe insulation on the first 6' of the hot and cold water line(s) when called for as an Optional Weatherization Measure (see Section I.B, of this Chapter). Various types of pipe insulations are acceptable, based on compliance with DOE/WAP Appendix A (see Chapter III., Section III.A.1, Minimum Standards for Wx Materials) and commercial availability. Water heater insulation shall be a minimum R-6. Pipe insulation shall be a minimum R-3.5.

PRECAUTIONS

Water heaters should be thoroughly inspected to determine whether they should be insulated using the following guidelines:

1. Tanks which leak or leaking pipes shall not be insulated.

2. If manufacturer's directions/warning labels indicate insulation is not recommended, tank shall not be insulated.

3. An operable temperature/pressure relief valve must be mounted to the tank (within the top 6") with the discharge directed downward, if not the tank shall not be insulated.

4. Combustion type water heaters must have their own exhaust vent directly to the chimney or outside properly installed with a minimum 1/4 inch/foot positive pitch; if not, the tank shall not be insulated.

5. Combustion type water heaters must have a cover plate attached, covering the burner opening; if not, the tank shall not be insulated.

6. Combustion type water heaters with a vent damper shall not be insulated.

WATER HEATER AND PIPE INSULATION APPLICATION

Water heaters to be insulated shall be wrapped utilizing one of the following:

1. Water heater insulation kits commercially available.

2. Batt or blanket-type insulation.

3. Reflective insulation products where space limitations would preclude options 1 and 2 (in such cases, a lower R-value will be accepted).

Note: The maximum flame spread classification for the insulation facing for water heater and pipe insulation is 150.

Insulation shall be secured to the water heater utilizing:

1. A minimum of three vinyl straps or belts commercially available for water heater jackets.

2. A minimum of three metal banding straps or wires.

3. A minimum of three strips of vinyl tape commercially available for water heater jackets. Each strip shall form two complete wraps around the water heater jacket.

Note: Fasteners shall not compress insulation more than 50 percent of its normal thickness.

Specifications and instruction panels shall be made accessible by cutting insulation on three sides around the panels to form a flap. If necessary, secure the flap with vinyl tape.

Insulation shall be cut and removed around all controls, service panels (including electrical access panels), air inlets, temperature/pressure relief valves, and drain valves.

Electric water heaters shall be completely wrapped (exceptions noted above), including the tops.

For combustion type water heaters, insulation should begin above the bottom cover plate (pilot/burner access panel) and not cover the top.

Pipe wrap is required for the first 6' of of the hot and cold water pipe leading from the tank. Pipe insulation shall start a safe distance above the top of the tank. If the hot or cold water line splits, the 6' requirement applies to all lines (overall 6' from where the pipe insulation starts). Refer to Subject C.4, Duct/Pipe Insulation/Repair, in this section.

Note: A minimum 6" clearance is required between insulation (including pipe wrap) and exhaust vents (18" for single wall vents to oil, wood, and coal furnaces).

INSTRUCTIONS TO CLIENT

Temperature setting of the water heater shall be discussed with client and the client shall be instructed on how the temperature can be adjusted.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	E.3
	Date Issued: November 2002		
Subject: Optional Weatherization Measures Clock Setback (Smart) Thermostat	**Supersedes:** January 1997		
	Page 1		

3. CLOCK SETBACK (SMART) THERMOSTAT

Clock thermostats shall only be called for in homes where clients have agreed to utilize the set-back for a reduced temperature a portion of the day and when determined appropriately by the NEAT audit or as an LWO optional measure (see Section I.B. of this chapter).

Thermostat shall be clock-operated type designed to provide a minimum of one setback period per 24 hours. Thermostat shall be compatible with existing furnace system. All thermostats installed shall display current room temperature.

INSTALLATION

Clock thermostats shall be installed and adjusted in accordance with the manufacturer's recommendations. Installation shall include an appropriate wall plate. In homes with multiple heating zones (i.e., hot water baseboard), clock thermostats shall be placed in all areas in which the client will utilize a set-back.

New clock thermostats should generally be installed in the same location as the old thermostats. In cases where the old thermostat is located in the kitchen, in direct sunlight, in front of a heat register, or other location which would impede performance, the new clock thermostat shall be relocated.

In cases where installation of a new thermostat is not possible (poor condition of wiring, incompatibility with the existing heating system, etc.), this item shall be not be attempted.

INSTRUCTIONS TO CLIENT

Clients shall be instructed on the setting and operation of new clock thermostats and the replacement of batteries for thermostats utilizing batteries.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Weatherization Measures	II	I	E.4
	Date Issued: November 2002		
Subject: Optional Weatherization Measures Furnace/Boiler/Space Heater Tune-up/Repair	**Supersedes:** January 1997		
	Page 1		

4. FURNACE/BOILER/SPACE HEATER TUNE-UP/REPAIR

When called for by the agency as an Optional Weatherization Measure or by the NEAT audit (see Section I.B. of this chapter), furnace, boiler, and space heater tune-ups and repairs shall be conducted by licensed mechanical contractors and shall include, but not be limited to, the following areas:

Check for gas, oil, and/or water leaks; check for leaks in the heat exchanger; pretesting and post testing including carbon monoxide test, efficiency test, draft test, and a smoke test (for oil); check venting system; check ducts/pipes (supply and return); check power supply/wiring; check for safety factors (i.e., clearance from combustibles); ensure adequate fuel supply to the control valve; clean the fire tubes, burner ports, heat exchanger, squirrel cage, combustion chamber, cabinet, blower housing and motor; adjust burner and gas input (set the manifold pressure to manufacturer's recommendations); adjust the pilot light and/or adjust the combustion blower (for power blower); replace the filter(s) if necessary; lubricate fans, motors, and pumps; check and adjust and/or replace belts (if worn); check and adjust thermostat; check blower and high limit controls; check the pressure regulator; adjust burner air shutters; use a Bacharach, Dwyer, or equivalent for setting furnace efficiency; check the temperature rise (make sure the rise is within the range listed on the furnace rating tag); and adjust the heat anticipator with the use of an amp probe.

A typical tune-up should result in a clean squirrel cage, return air plenum, combustion chamber, cabinet, heat exchanger, gas burners, oil filters, return air filter, etc. The above tune-up would result in a proper BTU input, replacement of defective wiring leading to the heating unit, oil pump pressure set at 100 psi or in accordance with the manufacturer's recommendations, replacement of the orifice if the unit is over or under fired, repair or replace sections of the venting (chimney) system that are ineffective/unsafe, ensure proper draft, ensure/adjust combustion efficiency, properly operating limit controls/automatic fuel safety shut-off/boiler controls, properly matched thermostat heat anticipator, etc. After the tune-up, the furnace should be performing within 5 percent of the manufacturer's AFUE rating or a minimum 70 percent, steady state efficiency.

DEFINITIONS

A tune-up involves a visual inspection, testing procedures, cleaning, and adjustments to improve the combustion and seasonal efficiency of the heating system.

Repairs involve the replacement or reconstruction of defective or unsafe parts for the purpose of ensuring the safe operation of the heating system.

TUNE-UP AND REPAIR PROCEDURES

The following guidelines for tune-ups and repairs to the various components of the heating system shall be completed as needed/authorized:

Fuel Supply

a. Repair leaks in fuel supply lines. Replacement fuel lines shall be in accordance with the applicable NFPA material code for the fuel type being serviced.

b. Change, clean, or add fuel filters in oil-fired systems.

c. Replace the oil nozzle in oil-fired heating systems according to the size on the furnace data plate or by performing a postweatherization heat loss calculation to determine the new nozzle size. Adjust or replace and adjust the electrodes.

d. Use a manometer to check the manifold gas pressure and adjust according to manufacturer's instructions or to 11" water column for LP/propane and 3.5" water column for natural gas. Set oil pump pressure @ 100 psi or in accordance with manufacturer's recommendations.

e. Verify the BTU input of metered fuel systems by clocking the meter. After adjusting gas pressure, replace orifices in propane and natural gas furnaces with the proper sized orifice if the unit is over or under fired.

Power Supply

Repair or replace defective wiring in, or leading to, the heating unit in accordance with NFPA 70, the National Electric Code.

Venting System

a. Repair or replace sections of the venting system that are seriously corroded or rusted, are clogged or blocked, contain cracks or holes, and/or are unsealed, loose, or disconnected in accordance with the applicable NFPA code. Clean solid fuel chimneys that contain creosote.

b. Perform a draft test on all vented combustion-type appliances and correct any draft and venting problems in accordance with the applicable NFPA code.

c. Ensure all venting materials meet clearances from combustible materials in accordance with the applicable NFPA code. When called for, correct cases where vent clearance requirements are not met. When insufficient vent clearance problems cannot be corrected, written notice shall be provided in accordance with Section III.D., Unsafe Conditions, in this chapter.

Heating Unit

a. Heat Exchanger

1. Clean the heat exchanger with a brush and vacuum cleaner to remove soot and debris.

2. Inspect the heat exchanger to determine whether cracks or holes are present. If cracks or holes are found, replace the heat exchanger, if a new one can be located, or refer the furnace for replacement. Questionable heat exchangers on gas furnaces shall be tested with a Sensit or equivalent for leaks.

b. Combustion Efficiency

1. Clean gas burners of dirt and rust.

2. Clean the combustion chamber on oil-fired units, replace or repair any defects in the combustion chamber, and seal the area around the air (blast) tube, inspection port, and other areas to reduce uncontrolled excess air. Also seal openings around power gas burners.

3. Ensure that sufficient combustion air exists in accordance with the applicable NFPA code.

4. Using a combustion analyzer, adjust primary and/or secondary air so that the unit is within the Acceptable Combustion Gas Levels from the applicable NFPA code. Other tune-up and repair items, such as fuel pressure and draft adjustments, may have to be performed prior to completing air adjustments.

c. Clearances

1. Ensure that the unit is located so that clearances from combustibles are in accordance with the applicable NFPA code.

2. When called for, move units that do not meet approved clearances, or install approved heat shielding materials to reduce the clearances needed in accordance with approved NFPA methods.

d. Limit Control

Test the limit control for proper function. Replace defective limit controls and test the new control upon putting the unit into operation.

e. Thermostat

1. Relocate improperly located thermostats to an area free from drafts or heat from the heating system, lights, or appliances.

2. Replace defective thermostats.

3. Adjust the heat anticipator in the thermostat to match the amp draw of the system controls.

f. Automatic Fuel Safety Shut-off

1. Test gas valves to ensure that in the event of a pilot outage, the flow of gas to the burners is interrupted.

For gas valves with 100 percent safety shutoff, ensure that flow of gas to the pilot is also interrupted in the event of a pilot outage. Ensure that the tip of the thermocouple is enveloped by the pilot flame. Replace defective gas valves and thermocouples.

2. Perform a safety check of the primary control and cad cell in oil-fired units. Replace defective primary controls or cad cells.

g. Boiler Controls

Verify that boiler safety controls such as the low water cut-off, automatic water feed, relief valve, and circulating pumps are functioning properly. Replace or repair any defective components.

h. Electric Furnaces

1. Check for proper sequencing and operation of elements. Replace defective elements or other defective components.

2. Check for adequate line voltage and correct as necessary.

i. Space Heaters

1. Agencies shall comply with the DOE Space Heater Policy contained in Subject C.8, Furnace/Boiler/Space Heater Replacement, of this section.

2. Tune-ups are allowed on vented oil, kerosene, and gas space heaters.

3. The repair of unvented space heaters is prohibited.

4. Only “incidental repairs” are allowed on electric space heaters.

Distribution System

a. Forced Air and Gravity Systems

1. Clean dirty blower motors, fans, and adjust or replace belts. Inspect the blower for excessive free play and correct as necessary. Inspect the pulleys and drive assembly for wear, alignment, and proper tension and correct as necessary. Replace worn or broken belts. Inspect the motor bracket for tightness and alignment and correct as necessary. Lubricate the motor and motor bearing cups if necessary.

2. Test the fan control to ensure that it is functioning properly. Set the fan "on" control to 110°F and the fan "off" to 90°F after determining that the customer's life-style will permit these settings. Replace defective fan controls.

3. Seal (with compatible sealing materials) unsealed blower compartment openings and blower compartment door.

4. Install missing or replace dirty return air filters. Instruct the customer on filter replacement.

5. Vacuum the heat transfer fins on electric baseboard units.

b. Boiler Systems

1. Repair any water leaks in the system.

2. Verify that the water circulating pump is properly activated by the aquastat. Set the pump on and off temperature according to manufacturer's recommendations.

3. Bleed any air from the distribution system. Assure that air vents and steam traps are properly functioning. Repair or replace defective vents or traps.

4. Ensure that thermostatically controlled zone valves are functioning properly. Repair or replace defective valves.

5. Adjust the aquastat high limit and pump control in accordance with manufacturer's recommendations. The maximum high limit setting is 200°F.

6. Lubricate the water circulating pump motor if necessary.

7. Verify the presence and proper functioning of a pressure relief valve and repair, replace, or add if necessary.

8. Vacuum and clean heat transfer fins or radiators.

9. Check the compression tank for sufficient air pressure. Replace defective tanks.

DOCUMENTATION REQUIREMENTS

Related Sections of the BCJO shall be completed by the contractor when furnace work is required (See Section IV.C, Combustion Appliance Inspection/Testing in this Chapter).

CERTIFICATION

Once the unit has been serviced, the installer must place a sticker on the heating unit, in plain view, certifying that the system has been properly serviced. The sticker shall indicate the date of service and the name and phone number of the service contractor.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Special Housing Measures	II	II	
	Date Issued: January 1997		
Subject: Special Housing Measures	**Supersedes:** June 1994		
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SPECIAL HOUSING MEASURES

At this time, the only special housing measures addressed are relative to mobile homes. Mobile home measures are contained in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Special Housing Measures	II	II	A
	Date Issued: November 2002		
Subject: Special Housing Measures Mobile Home Weatherization	**Supersedes:** June 1999		
	Page 1		

A. MOBILE HOME WEATHERIZATION

MOBILE HOMES MEASURES

Mobile homes measures as discussed in Section I.B of this Chapter include:

1. Health and Safety Measures
2. General Heat Waste (major bypasses, infiltration/exfiltration measures and water heater insulation).
1. Compact Fluorescent Light Bulbs
4. Attic Insulation (minimum R19)
5. Wall Insulation (minimum R11)
6. Floor Insulation (minimum R11)
7. Storm Windows
8. Duct/Pipe Insulation/Repair
9. Smoke Detectors
10. Venting of Clothes Dryers
11. Additional/Optional Weatherization Measures
12. Refrigerator Replacement (requires audit justification)

HEALTH AND SAFETY MEASURES

Health and Safety measures shall be addressed in accordance with the requirements and methods contained in Health and Safety, Section III, of this Chapter.

GENERAL HEAT WASTE

General heat waste on mobile homes shall be addressed in accordance with the requirements and methods contained in Infiltration/Exfiltration Measures and Water Heater Insulation requirements (see Section I of this Chapter).

COMPACT FLUORESCENT LIGHT BULBS

Incandescent bulbs can be replaced with compact fluorescent light bulbs (CFL) per WFM II.I.D.1.

ATTIC INSULATION

Mobile home roof and ceiling structures will generally not support the weight of additional snow loads and insulation. Attic insulation shall not be added unless the structure is determined to be adequate and ventilation is provided in compliance with Attic Ventilation requirements in this Chapter. When attic insulation is called for on mobile homes, it shall be installed in compliance with Attic Insulation requirements (see Section I.C.1 of this Chapter).

WALL INSULATION

Mobile home walls will generally not be insulated due to access problems and the structural strength of the mobile home walls.

Note: Although walls are not commonly addressed in mobile homes, uninsulated walls between unheated water heater closet and heated areas should be insulated, as well as other open wall cavities.

When wall insulation is called for on mobile homes, it shall be installed in compliance with Wall Insulation requirements (see Section I.C.14 of this Chapter).

FLOOR INSULATION

Floor/belly insulation shall be installed in compliance with Floor Insulation requirements in this Chapter (blown insulation is acceptable), and ventilation shall be provided in compliance with Foundation Ventilation requirements (see Section I.C.5 of this Chapter).

STORM WINDOWS

Storm windows shall be installed in compliance with Storm Window requirements (see Section I.C.12 of this Chapter).

DUCT/PIPE INSULATION/REPAIR

Duct/pipe insulation shall be installed in compliance with Duct/Pipe Insulation/Repair requirements (see Section I.C.4 of this Chapter). In addition all duct leaks should be repaired.

SMOKE DETECTORS

Smoke detectors shall be installed in compliance with Smoke Detector requirements (see Section I.C.11 of this Chapter).

VENTING OF CLOTHES DRYERS

Clothes dryers shall be vented to the exterior in compliance with the Venting Clothes Dryers requirements (see Section I.C.13 of this Chapter).

ADDITIONAL/OPTIONAL WEATHERIZATION MEASURES

Additional/optional weatherization measures (i.e., low flow shower heads, clock setback thermostat) and other necessary health and safety measures may be addressed on mobile homes at the agency's option. A consistent agency policy should be established as to whether additional measures will be addressed on mobile homes. Measures shall be completed in compliance with Section I of this Chapter.

REFRIGERATOR REPLACEMENT

When called for by evaluation using a NEAT Audit or the D&R International, LTD audit a refrigerator can be installed per WFM II.I.D.2.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Health and Safety	II	III	
	Date Issued: January 1997		
Subject: Health and Safety	**Supersedes:** June 1994		
	Page 1		

HEALTH AND SAFETY

Health and safety policies, procedures, and requirements are contained in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Health and Safety	II	III	A
	Date Issued: November 2002		
Subject: Health and Safety Health and Safety Guidelines	**Supersedes:** January 1997		
	Page 1		

A. HEALTH AND SAFETY GUIDELINES

The health and safety of clients, local weatherization operator (LWO) staff, and contractors is of primary concern. It is important that all personnel maintain a high level of awareness concerning the potential hazards associated with the weatherization process.

HEALTH AND SAFETY MEASURES ALLOWED

Weatherization funds may be used for the elimination of energy related health and safety hazards that are necessary before or because of the installation of weatherization materials.

Health and safety hazards specifically not to be abated under the Michigan Weatherization Program shall include hazards presented by asbestos, radon, lead, or toxic chemicals.

See CSPM 614.

HEALTH AND SAFETY CONCERNS/REQUIREMENTS

Weatherization activities can effect how a home works. As building tightness increases and the infiltration rate decreases, air quality problems can become an unintentional consequence. Low concentrations of pollutants or water vapor may become higher, potentially dangerous concentrations. Combustion and venting characteristics of combustion appliances (i.e., heating systems and domestic hot water heaters) may be effected, causing the release of unhealthy combustion by-products into the living space. It is crucial that the agency inspector be aware of the interactions between building tightness and potential indoor air quality problems. Ductwork leakage will play a role in this whole formula. An important part of the initial inspection of the home must be a thorough evaluation of potential indoor air quality problems.

Each home weatherized by an LWO must be assessed to detect the existence of potential hazards to workers or clients. If unsafe conditions exist that would endanger the health and safety of the clients or weatherization workers, and those conditions can not be corrected, no weatherization work may be started on that home.

The preinspection must include a health and safety inspection and discussion with the client relative to the following:

- Blower Door testing consistent with Section IV.A in this Chapter.
- An inspection of all combustion appliances for safety factors (see Section IV.C. of this Chapter).
- Furnace testing for safe operation (see Section IV.C of this Chapter).

- Carbon Monoxide testing of all combustion appliances in accordance with Section IV.B of this Chapter.
- Evaluation of the venting system, including back draft testing, of all vented appliances.
- Evaluation of the duct system (i.e., return air properly ducted and air-tight).
- A complete evaluation of existing and potential moisture problems.
- A review for the existence of any one of a number of hazardous substances (asbestos, lead paint, volatile organic compounds) that may be in the home.
- A review of the need for smoke detectors.
- Checking clothes dryers for proper venting.
- A review for structural safety.
- A review for means of egress.
- A review for electrical hazards.
- A review for fire hazards.
- A BCJO completed with respect to the above health and safety issues.

To ensure that the weatherization work that was completed does not create potential problems, each postinspection visit must include:

- A final blower door test after all work has been completed. This test must be consistent with Section IV.A in this Chapter to ensure that building tightness recommendations have not been exceeded.
- An inspection of all combustion appliances for safety factors (See Section IV.C of this Chapter).
- Furnace testing for safe operation (Section IV.C of this Chapter).
- Carbon monoxide testing of all combustion appliances in accordance with Section IV.B of this Chapter.
- Evaluation of the venting system of all combustion appliances, including testing for spillage and back drafting.
- An evaluation of the moisture conditions in the home and the attic (if attic work was completed).
- A review of all weatherization work completed with respect to health and safety (i.e., structural damage as a result of weatherization work).

If the postinspection indicates that weatherization work resulted in a health and safety problem, the agency must correct the problem prior to submitting the unit as a completion.

REQUIRED DOCUMENTATION

A BCJO shall be completed which will include health and safety factors.

ADDITIONAL HEALTH AND SAFETY REQUIREMENTS

Additional health and safety guidelines and requirements are contained in this section.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Health and Safety	II	III	B
	Date Issued: November 2002		
Subject: Health and Safety Asbestos	**Supersedes:** January 1997		
	Page 1		

B. ASBESTOS

DESCRIPTION

A fibrous, noncombustible mineral.

HEALTH/SAFETY CONCERNS

Asbestos fibers are microscopic. When disturbed and released into the air, the fibers can be inhaled. Significant exposure may result in lung cancer, asbestosis, or mesothelioma.

PROCEDURES

Known asbestos containing building components shall not be handled during the course of weatherization work in a way which would cause the transmission of asbestos dust into the air. This means there shall be no mechanical operations, such as sawing, drilling, or sanding of asbestos products which could create a potentially hazardous exposure to airborne asbestos particles.

Asbestos was commonly used as a duct and pipe insulation. Furnace work or other weatherization-related work should in no way disturb existing asbestos insulation. If work can be completed without touching the asbestos, it would be allowed. If it would be necessary to disturb the asbestos in order to do the work, it must first be abated by a licensed "asbestos abatement" contractor. The only option would be to delete the part of the work which could disturb the asbestos (proper documentation would be required).

There are state and federal regulations which control the methods of handling friable asbestos products. Friable asbestos is any asbestos containing product which can be crumbled, pulverized, or reduced to powder by hand pressure. Any such products can only be worked on by state licensed "asbestos abatement" contractors. Friable asbestos should not be touched. If friable asbestos is found in a home, written notification shall be provided to the client/owner. A sample letter of notification is included in this section/subject. A copy of the written notification shall be maintained in the client file.

Weatherization work is not required in areas where asbestos may be disturbed. If a weatherization measure is deleted due to the presence of asbestos, proper documentation shall be provided on the Building Check and Job Order Sheet. This decision would normally be made by the

preinspector. If the contractor or crew determines the presence of asbestos which would effect their ability to complete a prescribed weatherization measure in a safe manner without creating/disturbing asbestos dust, they shall notify the LWO and the measure shall be deleted (again, proper documentation shall be provided on the Building Check and Job Order Sheet).

Contractors and crews shall not be penalized for refusing to work on asbestos-sided homes. Blowing the walls from the interior shall be completed whenever possible with consideration relative to possible lead paint on asbestos-sided homes. Exterior access by siding removal is another option. Drilling or sawing asbestos siding is not allowed.

Note: Removal of asbestos siding requires workers and a supervisor who have attended asbestos training as specified in the MIOSHA Asbestos Standards for Construction (29 CFR 1926.1101) and shall adhere to the work practices and training set forth in that document, and other state and federal regulations concerning asbestos.

In summary, friable asbestos found in homes to be weatherized should not be touched and the LWO should provide written notification to the client/owner of its presence and a copy of the notification should be maintained in the client/job file (see last page of this Subject for a sample asbestos notice). Weatherization measures may be deleted due to the presence of asbestos containing products which could be disturbed if weatherization work were attempted. In such cases, the reason (presence of asbestos) shall be documented on the Building Check and Job Order Sheet.

Note: Asbestos abatement is not an allowable activity under the Weatherization Assistance Program.

For further information:

State regulations on asbestos are administered by the Michigan Department of Consumer and Industry Services, Division of Occupational Health, Asbestos Program, 7150 Harris Drive, Lansing, Michigan 48909. Phone: (517) 322-1320.

WEATHERIZATION PROGRAM
ASBESTOS NOTICE
State of Michigan
Family Independence Agency

Weatherization Agency Name:		
Address (Street Number and Name):		
City:	**State:** Michigan	**Zip Code:**
Telephone Number: ( )		

Client Name:		Address of Home (Street Number and Name):	
City:	State: Michigan	Zip Code:	Job Number:

This letter is to make you aware of the presence of asbestos containing materials in:

Person(s) Notified (Client, Landlord, Owner, Third Party):

This material should not be disturbed. There is no need for concern relative to the presence of this material if it is left undisturbed. Avoid any handling of this material which could put asbestos dust particles in the air. Airborne asbestos particles pose a potential health hazard. Removal should only be done by a licensed asbestos abatement contractor.

Weatherization workers are not qualified or allowed to work on any asbestos containing products which could create asbestos dust.

The Michigan Family Independence Agency, State Emergency Relief Program may be able to help with asbestos removal if the furnace is being replaced.

Further information on asbestos is available from the U.S. Consumer Product Safety Commission. They may be contacted by calling (800) 638-2772 or writing U.S. Consumer Product Safety Commission, Washington, D.C. 20207. Also, the U.S. Environmental Protection Agency has an "Asbestos Hotline" at (800) 368-5888. State regulations are administered by the Michigan Department of Consumer and Industry Services, Division of Occupational Health, Asbestos Program, 7150 Harris Drive, Lansing, Michigan 48909. Phone: (517) 322-1320.

A copy of this notice was sent to all parties of interest listed above (a copy shall be retained in the client file)	Signature of Agency Representative: Date:

AUTHORITY: P.A. 230 OF 1981 COMPLETION: Required PENALTY: None	The Family Independence Agency will not discriminate against any individual or group because of race, sex, religion, age, national origin, color, martial status, political beliefs or disability.

FIA - 4290 (Rev. 11-02) Previous edition obsolete.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Health and Safety	II	III	C
	Date Issued: November 2002		
Subject: Health and Safety Carbon Monoxide	**Supersedes:** January 1997		
	Page 1		

C. CARBON MONOXIDE (CO)

DESCRIPTION

An odorless/colorless gas produced as a product of combustion.

HEALTH AND SAFETY CONCERNS

It is a direct and cumulative poison. When combined with blood hemoglobin, CO replaces oxygen in the blood until it completely overcomes the body. Low level CO poisoning symptoms include headaches, confusion, dizziness, nausea, vomiting, convulsions, sleepiness, stinging eyes, and loss of muscular control. Death from CO poisoning occurs suddenly. A victim inhaling a toxic concentration of the gas may become helpless before realizing that danger exists.

Effects can vary significantly based on age, sex, weight, and overall state of health. Children, the elderly and the infirm may be seriously effected by even low levels of CO depending on the concentration and exposure period.

Potential CO related health and safety concerns shall be discussed with the client.

CARBON MONOXIDE TESTING

Carbon monoxide testing is required (see Section IV.B, Carbon Monoxide Testing, in this chapter).

CLIENT NOTIFICATION

Client shall be immediately advised of any serious concerns relative to CO.

If CO testing indicates a CO problem which cannot be corrected a Notice of Indoor Air Quality Concern shall be provided (see Section III.D, Indoor Air Quality, in this Chapter).

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Health and Safety	II	III	D
	Date Issued: January 1997		
Subject: Health and Safety Indoor Air Quality	**Supersedes:** January 1994		
	Page 1		

D. INDOOR AIR QUALITY

PROCEDURES

Preinspection procedures shall include a visual review and discussion with the client relative to potential indoor air quality (IAQ) problems, such as:

- Combustion by-products/carbon monoxide.
- Moisture/biologicals.
- Flaking lead-based paint.
- Friable asbestos.

IF IAQ problems are found, the client shall be advised and written notification shall be provided to the client, landlord, owner, and/or his/her agent. A copy of the written notice shall be maintained in the client file.

Where possible, "incidental repairs" or "health and safety" measures may be completed to correct IAQ problems in order to allow weatherization work to take place (i.e., installation of an exhaust fan to eliminate a moisture problem so that air-sealing can be completed). Client education shall be provided where appropriate (i.e., provide client with information relative to the hazards associated with the use of unvented space heaters, recommend not using; if used, recommend opening a window by the heater, provide information on warning signs of carbon monoxide poisoning).

If IAQ problems cannot be corrected, the agency shall make a determination as to whether the house shall be weatherized and, if so, whether air sealing should take place (i.e., for a home with minor moisture problems at the time of preinspection, it may be determined that the home should be weatherized, but not air sealed, so as not to contribute to additional moisture problems).

In addition to asbestos, carbon monoxide, and lead which are addressed in this section, other IAQ concerns include:

- Biologicals: Molds, mildews, and spores, primarily caused by excessive moisture levels in a home. These substances can be a significant contributing factor in a number of health problems. Excessive moisture in a home provides an environment that allows molds and mildews to flourish. Homes with serious moisture problems should not be tightened until measures are taken to mitigate the moisture sources.

- Volatile Organic Compounds (VOC): Cleaning fluids, paints, solvents, herbicides, pesticides, and formaldehyde. Known to be potential irritants to lungs, eyes, and skin. Some VOCs may be carcinogenic. VOCs are frequently stored under sinks, in closets, and basements. Formaldehyde may be found in a variety of building

components including plywood, carpeting, and particle boards. Recommend moving potentially dangerous material outside of living space into sheds or garages. Basements are not recommended for storage, particularly if leaky ductwork exists.

- Airborne Particulate Matter: Primarily tobacco smoke or smoke from improperly vented wood stoves. It is known to cause lung cancer. Excessive air-tightening can increase levels of carcinogenic by-products in homes. Homes with high levels of tobacco smoke or other indoor pollutants should not be over tightened (see Section IV.A. of this Chapter, Blower Door Testing).

- Fiberglass: Fibrous glass insulation material. Known to be an irritant to lungs, eyes and skin. Most preliminary research indicates no long-term negative health effects resulting from exposure to high levels of fiberglass, but some studies have indicated that some types of finely chopped blown-in fiberglass may be a potential carcinogen. Exposed fiberglass should not be left in occupied areas of homes. Workers are advised to wear properly rated respirators and protective clothing when working with or around fiberglass.

- Raw Sewage/Methane Gas: Workers must take precautions to avoid direct contact with raw sewage or other unsanitary conditions. Clients must be informed of existing conditions and referred to available resources for assistance.

NOTICE OF INDOOR AIR QUALITY CONCERNS

The following page contains a sample form for notification of IAQ problems.

Note: A copy of the notice shall be maintained in the client/job file.

For Further Information:

Further information on indoor air quality is available from the U.S. Consumer Product Safety Commission. It may be contacted by calling (800) 638-2772 or writing U.S. Consumer Product Safety Commission, Washington, D.C. 20207.

WEATHERIZATION PROGRAM
NOTICE OF INDOOR
AIR QUALITY CONCERN
State of Michigan
Family Independence Agency

Weatherization Agency Name:		
Address (Street Number and Name):		
City:	**State:** Michigan	**Zip Code:**
Telephone Number: ( )		

Client Name:		Address of Home (Street Number and Name):	
City:	State: Michigan	Zip Code:	Job Number:

Indoor Air Quality Concern:

Person(s) Notified (Client, Landlord, Owner, Third Party):

Recommendations:

Further information relative to Indoor Air Quality concerns is available from the U.S. Consumer Product Safety Commission: Call (800) 638-2772 or write U.S. Consumer Product Safety Commission, Washington D.C. 20207.

A copy of this notice was sent to all parties of interest listed above (a copy shall be retained in the client file)	Signature of Agency Representative: Date:

AUTHORITY: P.A. 230 OF 1981 COMPLETION: Required PENALTY: None	The Family Independence Agency will not discriminate against any individual or group because of race, sex, religion, age, national origin, color, martial status, political beliefs or disability.

FIA - 4289 (Rev. 11-02) Previous edition obsolete.

E. LEAD

DESCRIPTION

A metal contained in paints and various other substances.

HEALTH/SAFETY CONCERNS

Ingestion or absorption of lead into the blood stream is a serious health hazard causing brain damage over a period of time. This can be a particularly serious problem with small children, who may ingest paint chips or flakes or dust contaminated with lead products. Serious learning disabilities can result from excessive lead levels in the bloodstream. Workers can be contaminated in the same way as children, but are most likely to be exposed by breathing dust created by sanding or planing surfaces that contain lead based paints.

Lead paint is the primary source of lead in a home. Contamination occurs when lead paint is disturbed by sanding, chipping, or flaking.

PROCEDURES

Lead paint removal is not an allowable activity under the Weatherization Assistance Program.

To minimize risks to clients and weatherization personnel:

- All weatherization contractors, crew persons, and pre/postinspectors are to be trained and certified in "Lead Safe Work Practices".

- Do not disturb lead based paint particularly in homes with small children. Staff and contractors should assume that any paint on windows and doors contains lead, unless it has been verified otherwise.

- If paint chips/dust results from weatherization work, the area should be vacuumed and/or wiped clean using a detergent and water.

  Note: Per CSPM 614 this clean up is an allowed "Health and Safety" cost.

- Provide clients and workers with information regarding the dangers of lead poisoning. A Notice of Potentially Unsafe Condition (see Section III.F of this Chapter, Unsafe Conditions) should be provided if client safety concerns exist (i.e. child's bed located next to a window with flaking paint).

  Note: Use of lead in paint was discontinued in 1978.

CLIENT NOTIFICATION

Client notification requirements relative to lead are contained in CSPM 615.

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F. UNSAFE CONDITIONS

Unsafe conditions (i.e., gas leaks, electrical and structural problems) determined during the course of weatherization shall be documented and written notice shall be provided to the client, landlord, owner, and/or his/her agent. In cases where a third party is involved (i.e., utility had work done which resulted in an unsafe condition), the third party shall also be provided a copy of the written notice.

The following page contains a sample form for notification of unsafe conditions.

Note: A copy of the notice shall be maintained in the client/job file.

WEATHERIZATION PROGRAM
NOTICE OF POTENTIALLY UNSAFE CONDITION
State of Michigan
Family Independence Agency

Weatherization Agency Name:		
Address (Street Number and Name):		
City:	State: Michigan	Zip Code:
Telephone Number: ( )		

Client Name:		Address of Home (Street Number and Name):	
City:	State: Michigan	Zip Code:	Job Number:

Unsafe Condition:

Person(s) Notified (Client, Landlord, Owner, Third Party):

Recommendations:

Questions concerning “Lead” may be directed to the Environmental Protection Agency - LEAD HOTLINE: (800) 424-5323.

A copy of this notice was sent to all parties of interest listed above (a copy shall be retained in the client file)	Signature of Agency Representative: Date:

AUTHORITY: P.A. 230 OF 1981 COMPLETION: Required PENALTY: None	The Family Independence Agency will not discriminate against any individual or group because of race, sex, religion, age, national origin, color, martial status, political beliefs or disability.

FIA - 4288 (Rev. 11-02) Previous edition obsolete.

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Subject: Health and Safety Wiring	**Supersedes:** January 1997		
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G. WIRING

HEALTH/SAFETY CONCERNS

- Electric shock while working around wiring.
- Fire resulting from arcing between loose wiring connections
- Fire resulting from lack of dissipation of heat due to insulation over/around heat producing sources.
- Integrity and safety of knob and tube wiring.

TO MINIMIZE RISK

- Workers must demonstrate caution when working around wiring.
- Verify proper wiring connections and proper fusing.
- Verify proper blocking out of insulation around heat-producing sources.

INSULATING IN AREAS WITH WIRING

Inspection prior to installing insulation is critical to insure there are no potential hazards relative to the wiring.

In cases where insulation would cover knob and tube wiring (i.e., in wall cavities to be blown), the following is required:

- An inspection to ensure wiring to be covered is safe and in good condition.
- Protective devices (breakers or fuse stats and "S" type fuses) matched to the wire sizes which discontinue the flow of electrical current when the circuits are overloaded.

New insulation installed in attic areas containing knob and tube wiring shall not be in contact with the wiring. Blanket insulation (of the maximum thickness possible) should be installed under knob and tube wiring, and permanent barriers shall be provided to separate knob and tube wiring from loose fill insulation.

Work in areas containing knob and tube wiring shall be in compliance with requirements of the governing code.

Note: The responsible code official should be contacted relative to requirements for insulating in areas containing knob and tube wiring.

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Subject: Health and Safety Health and Safety Measures	**Supersedes:** January 1997		
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H. HEALTH AND SAFETY MEASURES

Health and safety measures may be completed to eliminate health and safety problems as described in this section.

MANDATORY HEALTH AND SAFETY MEASURES

Installation of smoke detectors and venting of clothes dryers are mandatory health and safety measures (see related requirements in Section I of this Chapter).

OPTIONAL HEALTH AND SAFETY MEASURES

At the agency's option, other work may be completed in order to eliminate energy related health and safety concerns. Such work is subject to the limitations contained in this Section.

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TESTING

Testing requirements relative to blower door testing, carbon monoxide testing, combustion appliance inspection/testing, and infrared scans are contained in this section.

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A. BLOWER DOOR TESTING

ACH PERCENTAGE REDUCTION/ACH % REDUCTION

Based on a preweatherization blower door test to determine the air changes per hour (ACH) at 50 pascals (Pa), the following guidelines shall be utilized in air sealing homes utilizing a blower door:

Pre ACH @ 50 Pa	Recommended ACH Percentage Reduction
0-5	No sealing work (mechanical ventilation may be needed).
6-10	Only "Major Bypasses" should be addressed.
11-17	A minimum 25 percent ACH reduction.
18-22	A minimum 35 percent ACH reduction.
23+	A minimum 40 percent ACH reduction.

CFM Percent/CFM (%) - To evaluate the Recommended ACH Percentage Reduction in terms of blower door tested cubic feet per minute (CFM) at 50 Pa the preinspection CFM would be reduced by the appropriate percentage based on pre ACH (discussed later in this subject).

Note: In cases where the above recommended ACH percentage reduction cannot be achieved, reasons shall be documented on or attached to the Blower Door Test Data Sheet/BC&JOS. The ACH reduction should not exceed minimum level of air sealing (addressed below).

MINIMUM LEVELS OF AIR SEALING

No home shall be sealed tighter than 1200 CFM 50 Pa when tested with a blower door. Each home should be evaluated for minimum sealing levels based on current occupants (CFM Persons) and potential future occupancy (CFM Bedrooms).

- Minimum CFM Persons/CFM(P) - For homes with more than 4 persons, the minimum CFM level shall be increased 300 CFM for each additional person in excess of four (i.e., 1500 CFM for 5 persons, 1800 CFM for 6 persons). Other factors which would contribute to air quality problems or excess moisture in a home which are not being corrected shall be considered and additional CFM allowed (i.e., 300 additional CFM for each smoker, 300 additional CFM for a St. Bernard kept inside, additional CFM for numerous houseplants, large aquariums, standing water).

- Minimum CFM Bedrooms/CFM(BR) - Homes shall also be evaluated for potential future increases in occupancy based on the number of bedrooms. The 1200 CFM minimum would generally be satisfactory for a three-bedroom home. The CFM level shall be increased 300 CFM for each bedroom beyond three (i.e., 1500 CFM for a four-bedroom, 1800 CFM for a five-bedroom) and additional

CFM shall be allowed for permanent moisture/indoor air quality (IAQ) problems (i.e., foundation leaks, drain problems).

Minimum CFM - Levels shall be determined by calculating both the Minimum CFM (P) and the Minimum CFM (BR), the higher CFM level shall be utilized as the minimum level for air sealing (Minimum CFM).

If calculated CFM(P) and CFM(BR) are below 1200 CFM 50, the 1200 CFM level should be used as the Minimum CFM/stopping point.

If a home is determined to be tighter than the recommended Minimum CFM level, mechanical ventilation (i.e., kitchen and bath exhaust fans and fresh air intake fans), outside fresh air intake ventilation, combustion air ducting to combustion appliances, and client education (i.e., eliminating sources of moisture, using fans or opening windows during cooking and showers) should be considered.

Example:

In utilizing the required standards the following calculations would be completed to determine the minimum air sealing level:

A. Persons/CFM (P): Actual number of persons in the household is 8, 2 are smokers, there is a slight moisture condition in the basement which cannot be corrected, and the client has a number of house plants and does a lot of cooking and canning. Minimum CFM for persons = minimum 1200 + (4 X 300, for the # of persons over 4 in the household) + (2 X 300, for the 2 smokers) + (300, for the moisture condition in the basement) + (600, for the plants/cooking) = 1200 + 1200 + 600 + 300 + 600 = 3900 CFM.

B. Bedrooms/CFM (BR): Number of bedrooms in this home is four bedrooms. Minimum CFM for bedrooms minimum 1200 + 300 (for the one bedroom over three) + 300 (for the moisture condition in the basement) = 1800 CFM.

C. Minimum CFM: Taking the GREATER of these two calculations indicates this home would need a minimum of 3900 CFM at 50 Pa for the health and safety of the persons in the home.

CFM GOAL

The CFM goal relative to air sealing is the highest calculated CFM level from the ACH Percentage Reduction (CFM[%]), Minimum CFM Persons (CFM[P]), and Minimum CFM Bedrooms (CFM[BR]). Homes may be sealed below the CFM(%), but not below the CFM(P) or CFM(BR) or 1200 CFM at 50 Pa.

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HOUSE SET-UP AND PREPARATION FOR BLOWER DOOR TESTING

The structure will be put into a generally winter operating condition and inspected for potentially hazardous situations prior to the blower door testing. This shall include:

1. Deactivate all combustion appliances (i.e., furnace, water heater) prior to depressurizing the structure by turning the thermostat down or the unit off.

   Do not perform a depressurization test on structures with operating drip pot fuel oil-fired, wood or coal combustion units (no fire/combustion during test). As an alternative, a pressurization test may be utilized.

2. Take precautions to prevent the ashes of wood/coal burning units from entering the living space by closing/sealing doors and dampers or by cleaning out or covering the ashes.

3. Inspect the house for loose or missing access doors, ceiling tiles, glazing panes, and/or fireplace dampers.

   a. Secure loose hatchways, ceiling tiles, or glazing panes/sashes that may be dislocated during the test. Close the fireplace damper.

   b. Temporarily seal major openings as needed, in cases where you cannot reach 50 pascals HOUSE pressure, to increase HOUSE pressure.

4. Close all prime windows, self-storing secondary windows, and exterior doors, then latch them as they normally would be found in the winter (if practical).

5. All areas normally heated or left open to heated areas in the winter should be left open to the interior of the structure for blower door testing.

6. Basements will normally be excluded from the test unless one of the following conditions is present:

   a. The basement is used as a living area.

   b. The client leaves the basement door open during the winter.

   c. The air returns do not connect directly to the furnace.

7. If there is a crawlspace opening into a basement to be tested, temporarily close off the crawl space during the test if it is to be closed off as a part of the weatherization work.

8. Do <u>not</u> seal up intentional openings (flues, dryer vents, vent fans, etc.).

BLOWER DOOR DEPRESSURIZATION TEST

The blower door should normally be set up to do a depressurization test. The blower door assembly should be set up according to the manufacturer's directions with the fan directed to push house air to the outside (depressurize house).

General set-up instructions for depressurization test:

1. Set up the blower door unit in a favorable location in an area open and free from obstructions, and shielded from wind gusts and from the air blast of the fan.

2. Attach a tube to the UPPER tap of the HOUSE pressure gauge (top gauge) and run the other end of the tube through the hole in the door panel.

3. Attach a tube to the fan tap and make a "T" connection to the LOWER taps of the FAN pressure gauges (bottom two gauges).

4. Install the fan directed to push inside air outside (the face where the low flow plate attaches is facing the inside).

5. Position the foot so the fan is stable.

6. Put the fan switch in the FORWARD position.

7. Take the gauge readings as discussed below.

8. When testing is completed, turn combustion appliances back on/check pilot lights and remove all temporary seals.

BLOWER DOOR PRESSURIZATION TEST

Pressurization, rather than depressurization, is desirable in some circumstances. For example, it is useful when trying to detect leaks in unconditioned areas, such as crawlspaces and attics. It is also the only way to test a house where there is a burning wood or coal stove. A depressurization test under these circumstances may draw ashes and flue gases into the living area.

You should be aware that pressurization during very cold weather can cool a house rather quickly. For this reason, pressurization during cold weather should be done only when absolutely necessary, and then done as quickly as possible.

If pressurization is necessary only for the purpose of leak location, simply flip the fan direction switch into the "reverse" position.

If gauge readings are to be taken during pressurization, the set-up needs to be modified as follows:

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1. Set up the blower door unit in a favorable location in an area open and free from obstructions, and shielded from wind gusts and from the air blast of the fan.

2. Attach a tube to the LOWER tap of the HOUSE pressure gauge (top gauge) and run the other end of the tube through the hole in the door panel.

3. Attach the fan pressure tube as you normally would. (The "T" is attached to the two LOWER taps of the FAN pressure gauges [bottom two gauges] and the other end is attached to the fan.)

4. Attach another "T" to the two UPPER taps of the FAN pressure gauge and run the other end outside the house, somewhere away from any fan turbulence.

5. Install the fan BACKWARDS. The fan should be directed to push outside air into the house (the face where the low flow plate attaches is facing the outside). The fan hose and the extra hose will run between the fan and the elastic collar.

6. Position the foot so the fan is stable. Put the fan switch in the FORWARD position.

7. Take the gauge readings as discussed below.

8. When testing is completed, turn combustion appliances back on/check pilot lights and remove all temporary seals.

HOUSE MEASUREMENTS AND BLOWER DOOR TESTING/CALCULATIONS

1. The size of the heated area will be measured for blower door testing purposes in order to determine the volume of the space to be tested.

   The volume of the heated space (areas used/heated in the winter) to be tested will be calculated using the formula Length x Width X Height for each of the structure's stories (add one additional foot to height for floors between heated areas). Add together the volumes calculated to determine the total volume.

   If the basement door is normally left open during the heating season, the basement volume should be included in the heated house volume.

   When the basement is closed off from the house during the test, the basement volume is excluded from the heated house volume calculation.

2. Set the fan to get a HOUSE pressure of 50 Pa (top gauge). If you can't reach 50 Pa, set the fan at the highest house pressure you can get (as noted above, major openings should be temporarily sealed as needed to increase HOUSE pressure).

3. Read the FAN pressure gauge (either of the bottom two gauges).

4. Use the FAN pressure to look up the cubic feet per minute (CFM) flow from the conversion chart in this Subject (for Minneapolis Blower Door, Model 3 or retrofit).

5. When unable to reach 50 Pa HOUSE pressure, look up the can't reach fifty factor (CRF), using the house pressure you got, from the CRF Multiplication Factor chart in this Subject.

6. Determine air changes per hour (ACH) @ 50 Pa. Multiply your fan CFM flow by 60 to get the cubic feet per hour (CFH). Multiply the CFH by the CRF (if you were able to get a house pressure of 50 Pa, the CRF is 1.00) to get an estimate of the CFH @ 50 Pa. Divide the CFH @ 50 Pa by the house volume to get the ACH @ 50 Pa.

Formula: $\text{ACH @ 50 Pa} = \dfrac{\text{CFM flow X 60 X CRF factor}}{\text{House Volume}}$

Example:

In order to determine the air changes per hour at 50 pascals for a home, you would first determine with the client the areas heated in the winter. (The home will be set up to duplicate these conditions.) The following calculations would be required to determine ACH at 50 Pa.

A. Determination of Volume of Heated Areas:

The home is a two story with a basement. The owner states the family is using the first and second floor areas in the winter, but normally keeps the basement door closed (only used for laundry and storage). The home is 40' long, 30' wide, with a ceiling height of 8' on the first floor and 7' on the second floor.

To determine the volume of the heated living areas, multiply length X width X height for each floor determined to be a heated living area.

First Floor - 40 X 30 X 8 = 9,600 cubic feet (CF)

Second Floor - 40 X 30 X 8 (7' ceiling height + 1' allowed for floor space between first and second floors) = 9,600 CF

19,200 CF

Note: Basement volume not included because the basement door is kept closed in the winter.

B. Determination of CFM at 50 Pa

The highest HOUSE pressure achieved during blower door testing is 40 Pa, which resulted in a FAN pressure of 210 Pa. Testing was done with an open fan (no rings used). The flow conversion

table in this Section shows a 210 Pa FAN pressure with an open fan to be the equivalent of 6898 CFM at 50 Pa. Since testing was done at a HOUSE pressure of 40 Pa, the value given in the table must be multiplied by the CRF factor (from the Can't Reach Fifty Multiplication Factor chart in this section) to determine the approximate CFM at 50 Pa.

6898 CFM X 1.16 = 8001.68 approximate CFM at 50 Pa

C. Determination of ACH 50 Pa

The CFM at 50 Pa is multiplied by 60 to determine the volume per hour (60 minutes in an hour) and divided by the total volume of heated area.

$$\frac{8002 \text{ CFM X } 60}{19200 \text{ CF}} = 25 \text{ ACH at } 50 \text{ Pa}$$

BLOWER DOOR TEST DATA SHEET/CONVERSION TABLE/CRF CHART

A Blower Door Test Data Sheet or the Blower Door Evaluation section of the BCJO shall be completed for each home tested with the blower door. All information requested shall be provided in the appropriate area and calculations completed (i.e., the number of occupants, number of smokers, number of bedrooms, and excessive moisture/indoor air quality problems shall be entered in the spaces provided, and this data shall be utilized to calculate the Minimum CFM recommended).

The Blower Door Test Data Sheet appears on page 12 of this Subject. Also included in the succeeding pages of this Subject are the Blower Door Flow Conversion Table and Can't Reach Fifty (CRF) Multiplication Factor chart to be utilized in completing entries/calculations on the Blower Door Test Data Sheet/BCJO (this table and chart are for Minneapolis "Model 3" blower doors or Minneapolis blower doors which have been retrofit).

Note: If blower door testing cannot be completed, the reason should be documented on the BCJO an the “At-risk” status calculated (WFM III.I.B).

MICHIGAN WEATHERIZATION PROGRAM
BLOWER DOOR TEST DATA SHEET

Name: _____ Job #_____ Date: _____
Address: _____

Household Info.	Const. Type	Dwelling	Pilot Lights		
# of Persons (1)	Balloon Frame	Single Family	Relight Needed	yes	no
# of Smokers **(2)**	Platform	Duplex	Furnace		
# of Bedrooms **(3)**	Other	Multi Family	H20 Tank		
Comments:		# of Units	Kit. Stove		

Number of Conditioned Stories:	**Living Space Floor Area (Sq. Ft.)**

First Floor	Length	X Width	=	sq ft X Height	(A) =	Cubic Ft.
Second Floor	Length	X Width	=	sq ft X Height	(B) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(C) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(D) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(E) =	Cubic Ft.
Cond. Bsmt.	Length	X Width	=	sq ft X Height	(F) =	Cubic Ft.
Conditioned Area is A + B + C +D + E + F		Total	=	sq ft	Total House Volume =	Cubic Ft.

BLOWER DOOR EVALUATION		**Existing Conditions/Sealing Levels/Testing**

Operational Exhaust Fans: ◯ **Bathroom** ◯ **Kitchen** ◯ **Other, Location:**

Properly Vented Clothes Dryer: ◯ **YES** ◯ **NO, Describe:**

MOISTURE: Excessive Moisture/I.A.Q. Problems (2) (4) ◯ **YES** ◯ **NO, If Yes Describe:**

Visual Review Done, ◯ **Yes** ◯ **No Moisture/Biologicals Evident ,** ◯ **Yes** ◯ **No, Location:**

Clothes Dryer Vent Needed ◯ **Yes** ◯ **No, Downspouts Needed** ◯ **Yes** ◯ **No, Exhaust Fan Needed** ◯ **Yes** ◯ **No**

Roof Repair Needed ◯ **Yes** ◯ **No, Roof Replacement Needed** ◯ **Yes** ◯ **No:**

Other Moisture Related Work ◯ **Yes** ◯ **No:**

CFM PERSONS (P): 1200 + _____ (+300/EACH OCCUPANT OVER 4) = _____ + _____ SPEC. COND. (2) = _____CFM (P)
CFM BEDROOMS (BR): 1200 + _____ (+300/EACH BEDROOM OVER 3) = _____ + _____ SPEC. COND. (4) = _____CFM (BR)
CFM PERCENT (%): 100 - _____ ACH % REDUCTION (5) = ._____ x _____ Pre CFM = _____ CFM (%)
MINIMUM CFM: _____ (highest (P)/(BR), Don't seal below Minimum CFM). CFM GOAL _____ (higher of P/BR/%-CFM)
ACTUAL % REDUCTION: (PRE _____) - (POST_____) = (_____) / (PRE_____) = _____% REDUCTION If less than ACH% reduction (5), document why: _____

Indicate Door (s) Used for Fan Set Up:

Fan Set up: ◯ **Pressurized** ◯ **Depressurized Low Flow Plate:** ◯ **ON** ◯ **OFF, Rings Used** ◯ **A,** ◯ **B,** ◯ **C**

House Pressure (Pa)			Fan Pressure (Pa)			Air Flow/Cu. Ft. Per Min @ 50 Pa.			Air Changes Per Hour		
Pre	**Mid**	**Post**	**Pre**	**Mid**	**Post**	**Pre**	**Mid**	**Post**	**Pre**	**Mid**	**Post**

Comment:

Pre-Retrofit Air Leakage Rate from Blower Door (CFM):_____ @ 50 Pascals

Estimated Post-Retrofit Air Leakage Rate from Blower Door (CFM):_____ @ 50 Pascals (Use CFM Goal Above)

NOTE: A MINIMUM OF 1200 CFM @ 50 PA IS REQUIRED
(1) PERSONS - NUMBER OF PERSONS NORMALLY LIVING IN THE HOUSE
(2) SMOKERS & / OR EXCESS MOISTURE / INDOOR AIR QUALITY PROBLEMS (WHICH WILL NOT BE CORRECTED), ADD ADDITIONAL CFM (300/SMOKER) TO" MINIMUM CFM" FOR "PERSONS".
(3) BEDROOMS - NUMBER OF BEDROOMS IN THE HOUSE (REGARDLESS OF CURRENT USE).
(4) PERMANENT MOISTURE / INDOOR AIR QUALITY PROBLEMS RELATIVE TO THE STRUCTURE. (I.E. FOUNDATION LEAKS, DRAIN PROBLEMS), ADD ADDITIONAL CFM TO "MINIMUM CFM" FOR "BEDROOMS".
(5) ACH % REDUCTION IS BASED ON PRE ACH: ACH 11-17/25%, ACH 18-22/35%, ACH 23+/40% (WFM II.IV.A.)

NOTE: If Blower Door testing cannot be completed, document why of the BCJO and calculate "At-risk" status (WFM III.I.B).

(All **outlined boxes** relate to **Computer Audit Data Screens**)

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Flow Conversion Table
Minneapolis Blower Door (Model 3 or Retrofit Models)

Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)	Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)
10 Pa.	1531	565	184	70	82 Pa.	4333	1599	533	212
12 Pa.	1675	618	201	77	84 Pa.	4385	1618	540	214
14 Pa.	1808	667	218	83	86 Pa.	4436	1637	546	217
16 Pa.	1931	712	233	89	88 Pa.	4487	1656	552	220
18 Pa.	2047	755	247	95	90 Pa.	4537	1675	559	222
20 Pa.	2156	796	261	101	92 Pa.	4586	1693	565	225
22 Pa.	2260	834	274	106	94 Pa.	4635	1711	571	227
24 Pa.	2360	871	286	111	96 Pa.	4684	1729	577	230
26 Pa.	2455	906	298	115	98 Pa.	4732	1747	583	232
28 Pa.	2547	940	309	120	100 Pa.	4779	1764	589	235
30 Pa.	2635	972	320	124	102 Pa.	4826	1782	595	237
32 Pa.	2721	1004	331	129	104 Pa.	4873	1799	601	240
34 Pa.	2803	1035	341	133	106 Pa.	4919	1816	607	242
36 Pa.	2884	1064	351	137	108 Pa.	4965	1833	613	245
38 Pa.	2962	1093	361	141	110 Pa.	5010	1849	619	247
40 Pa.	3038	1121	371	145	112 Pa.	5055	1866	624	249
42 Pa.	3112	1149	380	149	114 Pa.	5099	1882	630	252
44 Pa.	3185	1175	389	152	116 Pa.	5143	1899	635	254
46 Pa.	3255	1201	398	156	118 Pa.	5187	1915	641	256
48 Pa.	3325	1227	406	160	120 Pa.	5230	1931	646	259
50 Pa.	3392	1252	415	163	122 Pa.	5273	1947	652	261
52 Pa.	3459	1277	423	166	124 Pa.	5316	1962	657	263
54 Pa.	3524	1301	431	170	126 Pa.	5358	1978	663	265
56 Pa.	3588	1324	439	173	128 Pa.	5400	1993	668	268
58 Pa.	3651	1347	447	176	130 Pa.	5441	2009	673	270
60 Pa.	3713	1370	455	179	132 Pa.	5483	2024	678	272
62 Pa.	3773	1393	463	183	134 Pa.	5524	2039	684	274
64 Pa.	3833	1415	470	186	136 Pa.	5564	2054	689	276
66 Pa.	3892	1436	478	189	138 Pa.	5605	2069	694	278
68 Pa.	3950	1458	485	192	140 Pa.	5645	2084	699	281
70 Pa.	4007	1479	492	195	142 Pa.	5684	2099	704	283
72 Pa.	4063	1500	499	198	144 Pa.	5724	2113	709	285
74 Pa.	4118	1520	506	200	146 Pa.	5763	2128	714	287
76 Pa.	4173	1540	513	203	148 Pa.	5802	2142	719	289
78 Pa.	4227	1560	520	206	150 Pa.	5841	2156	724	291
80 Pa.	4280	1580	526	209	152 Pa.	5879	2170	729	293

Note 1: Flow conversion table applies where House pressure is at 50 Pascals (Pa).
Note 2: For house pressures of less than 50 Pa, multiply the appropriate CFM from this table (based on Fan Pressure and fan setup during testing times) by the appropriate Can't Reach Fifty Multiplication Factor (on page 11 of this Section).
Note 3: If the fan pressure is LESS than 30 Pa, install Low-Flow Ring A to improve measurement accuracy.
Note 4: Allow the gauge needles to stabilize before reading the gauge. During strong/gusty winds, pressure readings can vary significantly. Under these conditions, you will need to spend more time watching the gauges to determine the "BEST" reading.

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Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)	Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)
154 Pa.	5917	2184	733	295	232 Pa.		2675	903	366
156 Pa.	5955	2198	738	297	234 Pa.		2687	907	368
158 Pa.	5993	2212	743	299	236 Pa.		2698	910	370
160 Pa.	6030	2226	748	301	238 Pa.		2709	914	371
162 Pa.	6067	2240	753	303	240 Pa.		2721	918	373
164 Pa.	6104	2254	757	305	242 Pa.		2732	922	374
166 Pa.	6141	2267	762	307	244 Pa.		2743	926	376
168 Pa.	6177	2281	767	309	246 Pa.		2754	930	378
170 Pa.	6213	2294	771	311	248 Pa.		2765	934	379
172 Pa.	6249	2307	776	313	250 Pa.		2776	937	381
174 Pa.	6285	2321	780	315	252 Pa.		2787	941	383
176 Pa.	6321	2334	785	317	254 Pa.		2798	945	384
178 Pa.	6356	2347	789	318	256 Pa.		2809	949	386
180 Pa.	6392	2360	794	320	258 Pa.		2820	953	387
182 Pa.	6427	2373	798	322	260 Pa.		2831	956	389
184 Pa.	6461	2386	803	324	262 Pa.		2841	960	391
186 Pa.	6496	2398	807	326	264 Pa.		2852	964	392
188 Pa.	6530	2411	811	328	266 Pa.		2863	967	394
190 Pa.	6565	2424	816	330	268 Pa.		2873	971	395
192 Pa.	6599	2436	820	331	270 Pa.		2884	975	397
194 Pa.	6633	2449	824	333	272 Pa.		2895	978	398
196 Pa.	6666	2461	829	335	274 Pa.		2905	982	400
198 Pa.	6700	2474	833	337	276 Pa.		2916	986	401
200 Pa.	6733	2486	837	339	278 Pa.		2926	989	403
202 Pa.	6767	2498	842	340	280 Pa.		2936	993	404
204 Pa.	6800	2511	846	342	282 Pa.		2947	996	406
206 Pa.	6833	2523	850	344	284 Pa.		2957	1000	407
208 Pa.	6865	2535	854	346	286 Pa.		2967	1004	409
210 Pa.	6898	2547	858	347	288 Pa.		2978	1007	410
212 Pa.	6930	2559	862	349	290 Pa.		2988	1011	412
214 Pa.	6962	2571	866	351	292 Pa.		2988	1014	413
216 Pa.	6995	2583	871	353	294 Pa.		3008	1018	415
218 Pa.		2594	875	354	296 Pa.		3018	1021	416
220 Pa.		2606	879	356	298 Pa.		3028	1025	418
222 Pa.		2618	883	358	300 Pa.		3038	1028	419
224 Pa.		2629	887	360	302 Pa.		3048	1032	421
226 Pa.		2641	891	361	304 Pa.		3058	1035	422
228 Pa.		2653	895	363	306 Pa.		3068	1039	424
230 Pa.		2664	899	365	308 Pa.		3078	1042	425

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
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Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)	Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)
310 Pa.		3088	1045	427	388 Pa.		3451	1171	480
312 Pa.		3098	1049	428	390 Pa.		3460	1174	482
314 Pa.		3108	1052	430	392 Pa.		3468	1177	483
316 Pa.		3117	1056	431	394 Pa.		3477	1180	484
318 Pa.		3127	1059	433	396 Pa.		3486	1183	486
320 Pa.		3137	1062	434	398 Pa.		3494	1186	487
322 Pa.		3147	1066	435	400 Pa.		3503	1189	488
324 Pa.		3156	1069	437	402 Pa.		3512	1192	489
326 Pa.		3166	1072	438	404 Pa.		3520	1195	491
328 Pa.		3176	1076	440	406 Pa.		3529	1198	492
330 Pa.		3185	1079	441	408 Pa.		3538	1201	493
332 Pa.		3195	1082	442	410 Pa.		3546	1204	495
334 Pa.		3204	1086	444	412 Pa.		3555	1207	496
336 Pa.		3214	1089	445	414 Pa.		3563	1210	497
338 Pa.		3223	1092	447	416 Pa.		3572	1213	498
340 Pa.		3232	1095	448	418 Pa.		3580	1216	500
342 Pa.		3242	1099	449	420 Pa.		3589	1219	501
344 Pa.		3251	1102	451	422 Pa.		3597	1222	502
346 Pa.		3261	1105	452	424 Pa.		3606	1225	503
348 Pa.		3270	1108	454	426 Pa.		3614	1228	505
350 Pa.		3279	1112	455	428 Pa.		3622	1231	506
352 Pa.		3288	1115	456	430 Pa.		3631	1234	507
354 Pa.		3298	1118	458	432 Pa.		3639	1237	508
356 Pa.		3307	1121	459	434 Pa.		3647	1240	510
358 Pa.		3316	1124	460	436 Pa.		3656	1242	511
360 Pa.		3325	1128	462	438 Pa.		3664	1245	512
362 Pa.		3334	1131	463	440 Pa.		3672	1248	513
364 Pa.		3343	1134	464	442 Pa.		3681	1251	515
366 Pa.		3352	1137	466	444 Pa.		3689	1254	516
368 Pa.		3362	1140	467	446 Pa.		3697	1257	517
370 Pa.		3371	1143	468	448 Pa.		3705	1260	518
372 Pa.		3380	1147	470	450 Pa.		3713	1263	519
374 Pa.		3389	1150	471	452 Pa.		3722	1265	521
376 Pa.		3398	1153	472	454 Pa.		3730	1268	522
378 Pa.		3406	1156	474	456 Pa.		3738	1271	523
380 Pa.		3415	1159	475	458 Pa.		3746	1274	524
382 Pa.		3424	1162	476	460 Pa.		3754	1277	526
384 Pa.		3433	1165	478	462 Pa.		3762	1279	527
386 Pa.		3442	1168	479	464 Pa.		3770	1282	528

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Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)	Fan Pressure	Open Fan (CFM)	Ring A (CFM)	Ring B (CFM)	Ring C (CFM)
466 Pa.		3778	1285	529	484 Pa.		3850	1310	540
468 Pa.		3786	1288	530	486 Pa.		3857	1313	541
470 Pa.		3794	1291	531	488 Pa.		3865	1315	542
472 Pa.		3802	1293	533	490 Pa.		3873	1318	543
474 Pa.		3810	1296	534	492 Pa.		3881	1321	544
476 Pa.		3818	1299	535	494 Pa.		3889	1324	546
478 Pa.		3826	1302	536	496 Pa.		3897	1326	547
480 Pa.		3834	1305	537	498 Pa.		3904	1329	548
482 Pa.		3842	1307	539	500 Pa.		3912	1332	549

CAN'T REACH FIFTY

MULTIPLICATION FACTOR

House Pressure Achieved	CRF Factor
15 Pa. 20 Pa. 22 Pa.	1.95 1.81 1.71
24 Pa. 25 Pa. 26 Pa.	1.61 1.57 1.53
28 Pa. 30 Pa. 32 Pa.	1.46 1.39 1.34
34 Pa. 35 Pa. 36 Pa.	1.28 1.26 1.24
38 Pa. 40 Pa. 42 Pa.	1.20 1.16 1.12
44 Pa. 45 Pa. 46 Pa.	1.09 1.075 1.06
48 Pa 50 Pa	1.03 1.00

Note: For house pressures of less than 50 Pa, multiply the appropriate CFM from Blower Door Conversion Table times the appropriate Can't Reach Fifty Multiplication Factor in this section

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
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Subject: Testing Carbon Monoxide Testing	**Supersedes:** January 1997		
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B. CARBON MONOXIDE (CO) TESTING

All homes weatherized must be tested for CO levels during preinspections and postinspections. Tests shall include ambient air checks of all combustion appliances and any other questionable areas (i.e. closest register to furnace, chimney passing through a closet, etc.). Levels exceeding 9 parts per million (ppm) shall be noted/addressed.

The CO content of flue gases should be checked at each port. The maximum CO level in flue gas products is 100 ppm (400 ppm on start-up).

FOLLOW-UP ON CO PROBLEMS

Inform clients if a CO problem exists and recommend any temporary action to ensure client safety until the problem can be corrected.

Means of correcting the problem should be discussed with the client (i.e. client will correct problem, referral to available help sources, etc.). In cases where all sources of correction have been expired, the steps taken should be documented and the agency may address the problem as a health and safety measure in accordance with WFM II.III.

Conduct no weatherization activities that will tighten the home until it can be verified that the CO problem has been resolved.

CLIENT NOTIFICATION

Client shall be immediately advised of any serious concerns relative to CO.

If CO testing indicates a CO problem which cannot be corrected a Notice of Indoor Air Quality Concern shall be provided (see Section III.D, Indoor Air Quality, in this Chapter).

Note: See Section III.C of this Chapter, Carbon Monoxide.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
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Subject: Testing Combustion Appliance Inspection/Testing	**Supersedes:** June 1999		
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C. COMBUSTION APPLIANCE INSPECTION/TESTING

PREINSPECTION & POSTINSPECTION REQUIREMENTS

All combustion appliances shall be inspected and tested during preinspection & postinspection by a Certified Weatherization Inspector and/or a licensed mechanical contractor. Related sections of the BCJO should be completed (see WFM III.II.A.1).

Preinspection of combustion appliances shall include a complete inspection and testing for gas leaks, carbon monoxide, steady state efficiency of furnace/boiler, draft and smoke (for oil fueled units).

Postinspection of combustion appliances shall include, in all cases, ambient air testing for carbon monoxide (see Section IV.B of this Chapter) and draft testing to ensure the client's safety relative to indoor air quality. If the combustion appliances were addressed as a part of weatherization, all related work should be postinspected/tested (i.e., a new furnace installed should be inspected/tested for leaks, steady state efficiency, carbon monoxide in flue gases/ambient air, draft, venting, wiring, filter access, etc. and permit compliance should be reviewed).

C0MBUSTION APPLIANCE TESTING GUIDELINES

The following guidelines shall be followed by inspectors/mechanical contractors relative to combustion appliance testing and in conjunction with completion of related sections of the BCJO:

- Check all interior gas supply lines for leaks. Locations of leaks shall be identified. Leaks may be repaired as a Health and Safety Measure. In the case of minor leaks which are not being corrected, the client shall be provided a Notice of Potentially Unsafe Condition and referred to another help source if available. The severity of the leak should be used to determine necessary action (i.e., major natural gas leaks and all propane leaks should receive immediate attention).

- Required testing for carbon monoxide, oxygen, temperature, and smoke (smoke test applies to oil fueled units only), shall be completed by accessing undiluted flue gases.

  If the furnace/boiler has the draft diverter built into the unit, testing shall be completed at the opening from the heat exchanger into the diverter, so as to test undiluted flue gas. If the draft diverter is located on the vent line, a hole shall be drilled in the vent before the draft diverter to allow access for testing (locate hole as close as possible to the furnace/boiler cabinet, at least two-thirds the distance from the last elbow).

Induced draft units (Category 1) can be tested/drilled in the vent line near the heating unit (draft should be tested a minimum of 2 feet beyond inducer fan). For high efficiency units testing shall be completed at the discharge end of the vent.

Test readings shall be taken at the center of the heat exchanger opening or middle of the vent pipe.

Carbon monoxide testing of flue gases and ambient air shall be completed in accordance with Section IV.B of this Chapter.

Testing for steady state efficiency (oxygen and temperature) should take place after the flue gas has reached it's maximum temperature (generally about 10 minutes from the start-up, when there is no more then one degree temperature rise observed in one minute).

A smoke test is required for oil fueled units to determine the cleanliness of the burn/need for adjustment.

- Draft testing is required for combustion heating units and hot water heaters (except high efficiency units). Draft testing shall be completed by accessing the exhaust venting after (upstream from) any draft diverter which may exist.

  Draft required relates to outside temperature. After the furnace has reached steady state efficiency, the following guidelines are the recommended minimum negative draft requirements: -.005 inches of water column if over 80 degrees F, -.01 inches of water column if 30 to 80 degrees F, -.02 inches of water column if under 30 degrees F.

  Notes:

  1. Do not drill holes in PVC vents or in multi-walled mobile home vents.

  2. Holes drilled for testing shall be plugged. A corrosion resistant bolt, stainless steel plug, or high temperature furnace caulk may be used as a plug. Holes drilled in “B” vent should be plugged with a corrosion resistant bolt coated with high temp caulk, installed so as to seal both the inside and outside wall of the vent.

  3. There shall be no disassembly of the mechanical components of combustion appliances, unless completed by a licensed mechanical contractor.

  The Worst Case Depressurization of the Combustion Appliance Zone procedure for draft testing below should be followed and documented on the BCJO.

WORST CASE DEPRESSURIZATION OF THE COMBUSTION APPLIANCE ZONE/DRAFT TESTING

Combustion appliances shall tested under the worst case depressurization of the Combustion Appliance Zone (CAZ) conditions following appropriate safety and testing protocols.

Worst case is the configuration of the CAZ which is least likely to allow vented combustion appliances to be able to establish draft and adequately vent flue products to the outside of the structure.

This is accomplished by testing the CAZ pressure with reference to the outside under a variety of combinations of equipment operation and building configuration. Equipment operation includes operation of furnace blowers and exhausts fans such as clothes dryers, bath fans, range hoods, and Jenn-Aire range tops (do not operate whole house exhaust fans). Building configuration deals with window and door closures - both interior and exterior.

TO DETERMINE "WORST CASE DEPRESSURIZATION" OF THE CAZ:

Turn off combustion appliances to be tested.

Clean or remove furnace filter.

Close all exterior windows and doors.

Close fireplace or wood stove dampers.

Operate clothes dryer and all other building exhaust appliances (do not operate whole house exhaust fans).

Close all interior doors off the main body of the house (do not close doors to rooms that have a exhaust fan but no supply register).

With CAZ door to interior open, measure CAZ pressure with reference to the outside.

With CAZ door to interior closed, measure CAZ pressure with reference to the outside.

Operate furnace blower.

With CAZ door to interior closed, measure CAZ pressure with reference to the outside.

With CAZ door to interior open, measure CAZ pressure with reference to the outside.

The conditions which cause the greatest negative pressure measured in the CAZ would be considered "Worst Case Depressurization".

Note: If there is a fireplace in the CAZ, a blower door may be used to simulate approximately 300 CFM flow up the chimney.

WORST CASE DEPRESSURIZATION DRAFT AND CARBON MONOXIDE TESTING PRODEDURE:

The idea is to test the lowest BTUH appliance in the CAZ under the conditions which are least likely to allow it to function properly.

Order of testing:

The lowest BTUH appliance in the CAZ (usually the water heater) is always tested first.

Water Heater:

Create worst case depressurization of the CAZ.

For personal safety, measure Carbon Monoxide (CO) in the ambient air as all appliances are operated.

Fire the water heater.

The water heater should be able to establish a draft up the vent.

There should be no spillage of flue products from the draft hood after two minutes of operation.

After five minutes, measure for adequate draft in the vent.

After five minutes, measure for carbon monoxide in the undiluted flue products under the draft hood.

Operate the common vented heating appliance and retest the water heater (draft pressure should not decrease).

Furnace, Boiler, Space Heater:

Create worst case depressurization of the CAZ.

For personal safety, measure CO in the ambient air as all appliances are operated.

Fire the appliance.

The appliance should be able to establish a draft up the vent.

There should be no spillage of flue products from the draft hood after two minutes of operation.

After five minutes, measure for adequate draft in the vent.

After five minutes, measure for carbon monoxide in the undiluted flue products at the outlet of each cell or in the vent as applicable.

Operation of the heating appliance should not cause spillage at the draft hood or a reduction in draft at any other appliance.

Mid efficiency (80+) Category 1 appliances need to be checked for draft even if it means drilling a hole through type B vent.

Mid-efficiency (80% - Category 3, sidewall vented)and High efficiency (90% - Category 4) appliances are not checked for draft.

Note: If an appliance cannot establish draft or has spillage after two minutes, the appliance should be considered hazardous and should not be operated! The client should be notified immediately and the requirements contained in Section III, Health and Safety, should be followed.

WORK REQUIRED/MECHANICAL CONTRACTOR

In cases where problems are found/work is required on combustion appliances, the licensed mechanical contractor doing the work shall repeat the inspection and testing related to the work required and enter results on the BCJO along with documentation related to the work completed (see WFM II.I.C.8, WFM II.I.C.9, and WFM II.I.E.4).

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D. INFRARED SCANS

Agencies shall be responsible for infrared scans in compliance with the requirements of this Subject. Scans may be completed by LWO staff or an infrared scanning contractor.

For agencies electing to complete their own scans two infrared camera kits will be available from the State Weatherization Office for use by agency staff who have completed the Infrared Scanner Training (WFM III.IV.C). The State Weatherization Office will schedule times for use of the equipment with LWOs.

Scans shall be completed annually for each contractor/crew with priority given to jobs identified by the weatherization monitor and/or LWO inspector(s) for scanning.

Calculations shall be completed for each job scanned to determine the percent of void area present. Jobs containing void areas in excess of 5 percent will require corrective action. Additional scanning of the same contractor/crew shall be completed if repetitive problems are found (i.e., excessive settling due to low density insulation fill).

DOCUMENTATION REQUIREMENTS

The Infrared Scan Report form (FIA-4286[Rev. 6/99]) on the following page shall be completed for each job scanned with a copy maintained in the client/job file and a copy placed in a master file of all infrared scans completed for the PY. See sample completed form, page 3 of this Subject.

INFRARED SCAN REPORT
WEATHERIZATION PROGRAM

State of Michigan
Family Independence Agency

Weatherization Agency Name			
Job Number	Client Name		
Address (Street Number and Name)			
Contractor	City	State	Zip Code
Scan By	Date	Telephone Number ( )	

INTERIOR WALL ELEVATIONS (MAIN FLOOR)

A.	H.
B.	I.
C.	J.
D.	K.
E.	L.
F.	M.
G.	N.

INTERIOR WALL ELEVATIONS (2ND FLOOR)

1.	4.
2.	5.
3.	6.

Draw Views of Structure (Main Floor Plan)

Draw Views of Structure (2nd Floor Plan)

Symbols

BR -- Bedroom
DR -- Dining Room
B -- Bath
KC -- Kitchen Cabinets
KW -- Kneewall
LD -- Low Density
P -- Partition
? -- Scan Unclear
RA -- Return Air / Duct
SL -- Sloped Ceiling'
ST --Stairs
V -- Void
LR -- Living Room
K -- Kitchen
C -- Closet
FP -- Fireplace
III -- Studs
H -- Header
W -- Window
D -- Door

Comments

_____
_____
_____
_____
_____
_____
_____

(Void Area _____ SF) ÷ (Total Wall Area _____ SF) = _____% Void

Authority: PA 230 of 1981
Completion: Required
Penalty: None

The Family Independence Agency will not discriminate against any individual or group because of race, sex, religion, age, national origin, color, marital status, political beliefs or disability.

FIA-4286 (Rev. 6/99) Previous editions obsolete

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
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PROGRAM REQUIREMENTS - INTRODUCTION

This chapter contains the work related weatherization programmatic policies, procedures, and requirements for the Michigan Weatherization Program, including blower door test requirements, client/job file documentation requirements, standards for weatherization materials, and training and certification requirements. Additional requirements are contained in the Community Services Policy Manual.

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BLOWER DOOR TEST REQUIREMENTS

Blower door test requirements are contained in this section.

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	Date Issued: November 2002		
Subject: Blower Door Test Requirements Homes to be Tested	**Supersedes:** January 1997		
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A. HOMES TO BE TESTED

All homes weatherized under the National Energy Audit system (including measures priorities) and mobile homes require blower door testing (one-point test) during preinspection and on job completion.

Note: Conditions which prevent completion of blower door testing shall be documented on the Building Check and Job Order Sheet and the home shall be calculated for "at-risk" status (see Subject B in this Section).

DOCUMENTATION REQUIREMENTS

Results of blower door testing shall be documented on the Blower Door Test Data Sheet (see Chapter II, Section IV.A, Blower Door Testing) or BCJO (see Section II.A.1 of this Chapter) and maintained in the client/job file.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Blower Door Test Requirements	III	I	B
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Subject: Blower Door Test Requirements At-Risk Homes/Indoor Air Quality	**Supersedes:** January 1997		
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B. AT-RISK HOMES/INDOOR AIR QUALITY

As a guideline in determining homes which may be subject to moisture/indoor air quality problems, the following definition of "at-risk" homes is established:

> Any home where the house volume is less than 8400 cubic feet shall be considered "at-risk." For homes with more than four occupants, an additional 2100 cubic feet shall be added for each person over four.
>
> Other specific sources of additional moisture/indoor air quality problems in a home which are not being corrected, such as standing water, a high water table, smokers, numerous house plants, etc., should be treated as additional occupants (i.e., add one or two to the actual number of occupants in the home when calculating "at-risk" status).

REQUIRED CALCULATION FOR AT-RISK STATUS

Homes which cannot be blower door tested (reason documented on BCJO) shall be calculated for "at-risk" status on the last page of the Building Check and Job Order Sheet or on the At-Risk Home Status Worksheet contained in this Subject. Determine the total volume of the heated portions of the house (length X width X height). The actual volume shall be compared to the minimum volume calculated, to determine if the house is "at-risk." Homes determined to be “at-risk” should not be air sealed (except for addressing Major Bypasses, WFM II.I.B) and additional follow-up may be required (i.e., Notice of Indoor Air Quality Concern, health and safety measures, client education, etc.).

Example: To determine whether a home is "at-risk," the following calculations would be completed:

A. Determine total volume of heated space-A mobile home is measured and has a length of 70 feet, width of 16 feet, and ceiling height of 8 feet. The volume of heated space is calculated by multiplying 70 feet (length) X 16 feet (width) X 8 feet (height) = 8960 cubic feet.

B. Determine the cubic feet minimum relative to "at-risk" status-There are five persons living in the home and there is a moisture problem due to a large aquarium. 8400 cubic feet minimum + 2100 cubic feet (2100 for each person over four, 5 - 4 = 1, 1 X 2100 = 2100 cubic feet addition relative to the number of persons in the household) + 2100 cubic feet (relative to the aquarium) = 12,600 cubic feet minimum.

C. Determine if the actual cubic footage of heated space is below the minimum cubic footage requirement relative to "at-risk" status-Since the mobile home volume is less than the minimum cubic footage calculated for "at-risk" status, the home is considered "at-risk" and should not be further sealed, except for Major Bypasses. Conditions should be reviewed to determine if problems require further action (i.e., fresh-air venting, client education to address moisture problems, etc.).

AT-RISK HOME STATUS WORKSHEET/DOCUMENTATION REQUIREMENTS

The following page contains a sample worksheet which may be utilized to calculate “At-Risk” home status.

If the worksheet is utilized (in lieu of completing calculations on the last page of the BCJO), a copy shall be maintained in the client/job file.

Client: _____

Job Number: _____

At-Risk Home Status Worksheet

WFM III.I.B contains requirements relative to determining At-Risk Home Status.

(A) Actual Volume

Volume of Heated Area:

First Floor	Length	X Width	=	sq ft X Height	(A) =	Cubic Ft.
Second Floor	Length	X Width	=	sq ft X Height	(B) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(C) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(D) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(E) =	Cubic Ft.
Cond. Bsmt.	Length	X Width	=	sq ft X Height	(F) =	Cubic Ft.
Conditioned Area is A + B + C + D + E + F		Total	=	sq ft	Total House Volume =	Cubic Ft.

A. Total House Volume: _____ Cu. Ft.

(B) Minimum Volume

Minimum Volume (up to 4 occupants) = a) 8400 cu. ft.

+_____ # of occupants over 4 x 2100 cu. ft. = b) _____

+_____ # of I.A.Q. problems x 2100 cu. ft. = c) _____

B. Total Minimum Volume (a + b + c): _____ **Cu. Ft.**

(C) At-Risk Status

☐ **Not At-Risk** - If "A" is greater than "B", then seal house according to normal weatherization procedures

☐ **At-Risk** - If "B" is greater than "A", then the home is considered "At-Risk" and should not be further sealed, except for addressing "Major Bypasses" (WFM II.I.B) and agency follow-up (i.e., Notice of Indoor Air Quality Concern, health and safety measures).

*Add additional Cubic Feet for indoor air quality (I.A.Q.) problems which will not be corrected (i.e., smokers, standing water).

Note: The BCJO should be documented relative to the reason why a blower door test could not be completed.

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CLIENT/JOB FILE REQUIREMENTS/DOCUMENTATION

Client/job file requirements/documentation relative to the job site and completed units are contained in this section.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
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Subject: Client Job File Job Site	**Supersedes:** June 1994		
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A. JOB SITE REQUIREMENTS

Job site documentation requirements are contained in this section/subject including:

1. Building Check & Job Order Sheet

2. Client Plan of Action

3. Client Inspection/Assessment

Also contained in this section/subject is a definition of requirements for a unit to be considered as a weatherization completion ("Unit Completion Reference").

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Client Job File Requirements/Documentation	III	II	A.1
	Date Issued: November 2002		
Subject: Client Job File Building Check and Job Order Sheet (BCJO)	**Supersedes:** June 1999		
	Page 1		

1. BUILDING CHECK & JOB ORDER SHEET (BCJO)

BCJO COMPLETION REQUIREMENTS

Each unit weatherized shall have weatherization work documented on the BCJO. This form shall be completed during the course of the weatherization work including:

- Client information.
- Preinspection data including estimated materials/costs.
- Testing results (blower door, combustion appliances, etc.).
- Actual materials/costs.
- Sign-offs.

Note: A computer print-out may be utilized to break out individual costs per measure if included in the Client/Job file.

Any drawings, spread sheets, NEAT data sheets, or other information utilized in conjunction with completion of the BCJO and the NEAT audit shall be referenced on the appropriate page of the BCJO and included in the client/job file.

The BCJO must be completely filled out including all cost information and sign-offs, and shall be filed in the client/job file along with all related information (i.e., application, Client Inspection and Assessment form, invoices, Certificate of Insulation, health and safety notifications, Client Plan of Action) pertaining to the job, before the job, is reported as a completion.

BCJO/MULTI FAMILY BUILDINGS

A BCJO shall be completed for buildings/units weatherized. The BCJO shall be fully completed including all general information, measures/materials, costs, and sign-offs.

The files shall clearly indicate what work was done to the entire building--documented by using one comprehensive BCJO or a BCJO for each unit. In addition, weatherization work performed in common areas (i.e., hallways, attics, basements, etc.) shall be documented on the BCJO.

All client files for the building must be clearly cross-referenced so that any reviewer can easily determine building eligibility under the 66 percent (50 percent) rule, or any other aspect of the total weatherization work to that multifamily building. The file(s) must clearly indicate it is a multifamily building.

COSTS

The following requirements apply relative to recording of job related costs:

- Identify charges according to funding source.

- All weatherization related costs must be itemized on the BCJO (i.e. DOE, LIHEAP, etc.)
- Agencies utilizing a computer print-out must organize the costs in the same priority order as the BCJO.

BCJO FORMS

There are three versions of the BCJO contained in the following pages of this Subject:

- FIA-4284M (Rev. 11/02) - Is to be used for mobile homes.
- FIA-4284P (Rev. 11/02) - Is to be used for qualifying standard wood frame homes (WFM II.I.B) to be weatherized in accordance with the Weatherization Measures Priorities.
- FIA-4284 (Rev. 11/02) - Is to be used for homes to be evaluated using NEAT. May also be used for qualifying standard wood frame homes (WFM II.I.B) to be weatherized in accordance with the Weatherization Measures Priorities.

See CSPM 612.1.

FAMILY INDEPENDENCE AGENCY	Mobile Home	Agency:_____
BUILDING CHECK AND JOB ORDER SHEET		Job Number_____

Client's Last & First Name:	
Street:	
City:	Phone:
Contact Person/Landlord:	Contact Phone:
Directions to House and Special Conditions:	

Foundation Type: ◯ Heated Foundation ◯ Unheated Foundation ◯ Non Vented Foundation ◯ Vented Foundation ◯ Slab	Air Conditioned ◯ Yes ◯ No

Total Weatherization Costs:	Total Material Costs:	Total Labor Cost/Hours:
DOE Funds:	_____ Funds:	_____ Funds:

	Preinspection	Approved to Start	Job Started	Job Completed	Post Inspection	Final Sign Off
Date:						
Initials:						

Insulation Certificate attached: ◯ Yes ◯ No ◯ NA

MOBILE HOME MEASURES	Install Yes	(√) No	If No, Cite Reason:
HEALTH & SAFETY:			
Smoke Detectors:			
Clothes Dryer Vent:			
Other:			
MEASURES PRIORITIES:			
Air Sealing/Infiltration/Exfiltration:			
Compact Flourescent Light Bulbs:			
Water Heater Insulation:			
Wall Insulation:			
Attic Insulation:			
Floor/Belly Insulation:			
Duct/Pipe Insulation:			
Duct Sealing/Repair/Replacement:			
Storm Windows:			
Refrigerator Replacement (min **SIR 1.5**):			
OPTIONAL/ADDITIONAL MEASURES:			
Low Flow Shower Head:			
Clock Thermostat:			

Job Number:_____

	Install Yes	(√) No	If No, Cite Reason:	
INCIDENTAL REPAIRS:				

HEALTH AND SAFETY EVALUATION/CLIENT NOTIFICATION

Smoke Detectors: Existing_____ Needed_____ Batteries Needed_____ Recommended Location(s):

Dryer Vents: Existing_____ Needed_____ NA_____ Recommended Location(s):

Other Health and Safety Comments:

Structural Problems/Repairs Needed ◯ Yes ◯ No:

Wiring: Romex ◯ Yes ◯ No, Other_____ Wiring Problems/Repairs Needed ◯ Yes ◯ No:

Indoor Air Quality Problems/Repairs Needed ◯ Yes ◯ No:

Other Health and Safety Problems/Repairs Needed ◯ Yes ◯ No:

CLIENTS AND OTHER INTERESTED PARTIES SHALL BE PROVIDED WRITTEN NOTICE OF HAZARDS IN ACCORDANCE WITH THE HEALTH AND SAFETY STANDARDS. A COPY SHALL BE MAINTAINED IN THE CLIENT/JOB FILE.

CLIENT **NOTIFIED IN WRITING** OF BELOW CONDITIONS (if existing):

Notice of Indoor Air Quality Concern ◯ Yes ◯ No, Comments:

Notice of Potentially Unsafe Condition ◯ Yes ◯ No, Comments:

Asbestos Notice ◯ Yes ◯ No, Comments:

Lea Paint Notice ◯ Yes ◯ No, Comments:

HEALTH AND SAFETY COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL HEALTH AND SAFETY COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

Household Info.	Const. Type	Dwelling	Pilot Lights		
# of Persons **(1)**	Balloon Frame	Single Family	Relight Needed	yes	no
# of Smokers **(2)**	Platform	Duplex	Furnace		
# of Bedrooms **(3)**	Other	Multi Family	H20 Tank		
Comments:		# of Units	Kit. Stove		
Number of Conditioned Stories:		Living Space Floor Area (Sq. Ft.)			

First Floor	Length	X Width	=	sq ft	X Height	(A) =	Cubic Ft.
Second Floor	Length	X Width	=	sq ft	X Height	(B) =	Cubic Ft.
Other	Length	X Width	=	sq ft	X Height	(C) =	Cubic Ft.
Other	Length	X Width	=	sq ft	X Height	(D) =	Cubic Ft.
Other	Length	X Width	=	sq ft	X Height	(E) =	Cubic Ft.
Cond. Bsmt.	Length	X Width	=	sq ft	X Height	(F) =	Cubic Ft.
Conditioned Area is A + B + C +D + E + F		Total	=	sq ft	Total House Volume	=	Cubic Ft.

BLOWER DOOR EVALUATION		Existing Conditions/Sealing Levels/Testing

Operational Exhaust Fans: ◯ **Bathroom** ◯ **Kitchen** ◯ **Other, Location:**

Properly Vented Clothes Dryer: ◯ **YES** ◯ **NO, Describe:**

MOISTURE: Excessive Moisture/I.A.Q. Problems (2) (4) ◯ **YES** ◯ **NO, If Yes Describe:**

Visual Review Done, ◯ **Yes** ◯ **No Moisture/Biologicals Evident ,** ◯ **Yes** ◯ **No, Location:**

Clothes Dryer Vent Needed ◯ **Yes** ◯ **No, Downspouts Needed** ◯ **Yes** ◯ **No, Exhaust Fan Needed** ◯ **Yes** ◯ **No**

Roof Repair Needed ◯ **Yes** ◯ **No, Roof Replacement Needed** ◯ **Yes** ◯ **No:**

Other Moisture Related Work ◯ **Yes** ◯ **No:**

CFM PERSONS (P): 1200 + _____ **(+300/EACH OCCUPANT OVER 4) =** _____ **+** _____ **SPEC. COND. (2) =** _____**CFM (P)**
CFM BEDROOMS (BR): 1200 + _____ **(+300/EACH BEDROOM OVER 3) =** _____ **+** _____ **SPEC. COND. (4) =** _____**CFM (BR)**
CFM PERCENT (%): 100 - _____ **ACH % REDUCTION (5) = .**_____ **x** _____ **Pre CFM =** _____ **CFM (%)**
MINIMUM CFM: _____ **(highest (P)/(BR), Don't seal below Minimum CFM). CFM GOAL** _____ **(higher of P/BR/%-CFM)**
ACTUAL % REDUCTION: (PRE _____**) - (POST**_____**) = (**_____**) / (PRE**_____**) =** _____**% REDUCTION If less than ACH% reduction (5), document why:**_____

Indicate Door (s) Used for Fan Set Up:

Fan Set up: ◯ **Pressurized** ◯ **Depressurized Low Flow Plate:** ◯ **ON** ◯ **OFF, Rings Used** ◯ **A,** ◯ **B,** ◯ **C**

House Pressure (Pa)			Fan Pressure (Pa)			Air Flow/Cu. Ft. Per Min @ 50 Pa.			Air Changes Per Hour		
Pre	Mid	Post	Pre	Mid	Post	Pre	Mid	Post	Pre	Mid	Post

Comment:

NOTE: A MINIMUM OF 1200 CFM @ 50 PA IS REQUIRED
(1) PERSONS - NUMBER OF PERSONS NORMALLY LIVING IN THE HOUSE
(2) SMOKERS & / OR EXCESS MOISTURE / INDOOR AIR QUALITY PROBLEMS (WHICH WILL NOT BE CORRECTED), ADD ADDITIONAL CFM (300/SMOKER) TO" MINIMUM CFM" FOR "PERSONS".
(3) BEDROOMS - NUMBER OF BEDROOMS IN THE HOUSE (REGARDLESS OF CURRENT USE).
(4) PERMANENT MOISTURE / INDOOR AIR QUALITY PROBLEMS RELATIVE TO THE STRUCTURE. (I.E. FOUNDATION LEAKS, DRAIN PROBLEMS), ADD ADDITIONAL CFM TO "MINIMUM CFM" FOR "BEDROOMS".
(5) ACH % REDUCTION IS BASED ON PRE ACH: ACH 11-17/25%, ACH 18-22/35%, ACH 23+/40% (WFM II.IV.A.)

Job Number:_____

AIR SEALING/INFILTRATION/EXFILTRATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
Major Bypasses:				
Infiltration/Exfiltration:				
TOTAL AIR SEALING/INFILTRATION/EXFILTRATION COSTS:				

COMPACT FLOURESCENT LIGHT BULBS COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL COMPACT FLOURESCENT LIGHT BULB COSTS:				

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

WATER HEATER INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL WATER HEATER INSULATION COSTS:					

WALL INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL WALL INSULATION COSTS:					

ATTIC INSULATION/VENTILATION

Ceiling Area: Location	Width	Length	Sq.Ft. Area	Existing Insulation Y	N	Type/# Inches	R	Existing Ventilation Y	N	# Vents	Size	Location

A. Access: ◯ Existing, ◯ New. Location/Comments:_____

_____, Client's permission (optional) to install new access, Client Initial: _____

B. Heat producing sources requiring dam/barriers? ◯ Yes ◯ No. Quantity/types/locations:_____

_____

C. Wiring in areas to be insulated? ◯ Yes ◯ No, K&T? ◯ Yes ◯ No, Wiring Problems? ◯ Yes ◯ No. _____

Comments:_____

D. Moisture Problems? ◯ Yes ◯ No. Comments: _____

E. Structural Problems? ◯ Yes ◯ No. Comments: _____

ATTIC INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ATTIC INSULATION COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

ATTIC VENTING REQUIRED

Existing soffit vents requiring treatment to prevent blockage? ◯ Yes ◯ No, If yes, note material needed:

Can soffit vents be installed? ◯ Yes ◯ No, Indicate reason why soffit vents not used:

Attic Code	(A) Total Area Sq. Ft.	(B)Formula (300 or 600)	(C) Venting Required Sq. Ft. (A/B)	(D) Venting Required Sq. In. (Cx144)	(E) Existing Venting Sq. In.	New Venting Req'd Sq. In. (D-E)

Install New Vents in the following Location(s) - Designate for Each Attic Area:

ADDITIONAL ATTIC INSULATION AND/OR VENTILATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDITIONAL ATTIC INSULATION AND/OR VENTILATION COSTS:				

FOUNDATION EXISTING CONDITIONS

Floor Area: Location	Width	Length	Sq.Ft. Area	Existing Insulation Y	N	Type/# Inches	R	Existing Ventilation Y	N	# Vents	Size	Location

A. Insulation Needed? ◯ Yes ◯ No. _____
Ground Cover Needed? ◯ Yes ◯ No. _____
B. For Perimeter: _____ Lineal feet X _____ Height of wall (add 2' for floors above frost line) = _____ Sq. Ft.
C. Joist Pockets: Open joist pockets? ◯ Yes ◯ No, depth: _____ Inches, 16 or 24 o.c.: _____, Height from ground to joists: _____ Inches.
D. Access: ◯ Existing, ◯ New. Location/Comments: _____
_____, Client's permission (optional) to install new access, Client Initial: _____
E. Doors between heated and unheated areas? ◯ Yes ◯ No. If yes, describe locations/recommendations: _____
Note: Mobile Homes installed over a crawl space or basement, which are being provided with floor insulation, should be vented in accordance with WFM II.I.C.8.

FOUNDATION/ FLOOR/BELLY INSULATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL FOUNDATION/FLOOR/BELLY INSULATION COSTS				

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

DUCT/PIPE INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL DUCT/PIPE INSULATION COSTS:					

DUCT SEALING/REPAIR/REPLACEMENT COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL DUCT SEALING/REPAIR/REPLACEMENT COSTS:					

STORM WINDOW COSTS*

No.	Width	Height	Type	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
Other:							
TOTAL STORM WINDOW COSTS:							

OPTIONAL/ADDITIONAL WEATHERIZATION MEASURES COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL OPTIONAL/ADDITIONAL WEATHERIZATION MEASURES COSTS:					

INCIDENTAL REPAIR COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL INCIDENTAL REPAIR COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

ALL COMBUSTION APPLIANCES		Pre-Insp.	Contractor	Post-Insp.
AT ANY POINT DURING INSPECTION AND TESTING, IF A PROBLEM INDICATES APPLIANCE SHOULD BE REPLACED, THE PROBLEM SHOULD BE DOCUMENTED AND FURTHER TESTING IS NOT NECESSARY				
Wiring problems?		Yes No NA	Repaired NA	Yes No NA
Scorch/burn marks, corrosion evident?		Yes No NA	Yes No NA	Yes No NA
Clearances from combustibles adequate?		Yes No NA	Yes No NA	Yes No NA
Floor or wall/fire protection needed?		Yes No NA	Yes No NA	Yes No NA
Problems with the metal/masonry venting system (i.e., clearances, deterioration, slope 1/4" min. rise/ft., obstruction)?		Yes No NA	Yes No NA	Yes No NA
CO in ambient air (Check by all combustion appliances. If 10 or more PPM, note recommended actions below***).	Furnace:_____	_____PPM	_____PPM	_____PPM
	Water Heater:_____	_____PPM	_____PPM	_____PPM
	Gas Dryer:_____	_____PPM	_____PPM	_____PPM
	Gas Stove:_____	_____PPM	_____PPM	_____PPM
	Other/Specify:_____	_____PPM	_____PPM	_____PPM
Furnace Draft Test	(Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Water Heater Draft Test	(Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Other_____Draft Test	(Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Did you detect any leaks (i.e., fuel, water, exhaust, steam)?		Yes No NA		
If yes, location of leak?		Yes No NA		
If yes, did you correct leak?			Repaired NA	Yes No NA
Does inspection of unit indicate it should be removed from service?		Yes No NA		
If yes, give reason(s):				
	Non-operational._____	Yes No NA	Yes No NA	Yes No NA
	Illegal-unvented (can't be vented)._____	Yes No NA	Yes No NA	Yes No NA
	No safety controls (can't be added)._____	Yes No NA	Yes No NA	Yes No NA
	Obvious crack/hole in heat exchanger._____	Yes No NA	Yes No NA	Yes No NA
	Leaking beyond repair._____	Yes No NA	Yes No NA	Yes No NA
	Other:	Yes No NA	Yes No NA	Yes No NA
Client provided with written notice?		Yes No NA	Yes No NA	Yes No NA
*** After testing unit(s), did you find anything to indicate that unit(s) should be tuned/repaired/replaced? Reasons/comments:		Yes No NA	Yes No NA	Yes No NA

NOTE: When installing a **New Furnace** (complete appropriate sections above) provide **MANUFACTURER**_____

MODEL _____ **FUEL TYPE**_____ **BTUs**_____

PERMIT #_____ **PERMIT JURISDICTION:**_____ ❒ **Or Copy Attached**

FURNACE SIZED: ❒ **Per Manual J,** ❒ **Per NEAT - Note Candidate/Weatherization Measures turned off to size:**

Additional Comments:

Note: Contractor must complete all entries including retesting when applicable.

Job Number:_____

DRAFT - SPILLAGE - CO - TESTING CHECKLIST AND SUMMARY

SETUP

Heating Appliance and Water Heater Off: ❑ Yes
Furnace Filter Clean or Removed: ❑ Yes
All Exterior Windows and Doors Closed: ❑ Yes
Fireplace or Wood Stove Dampers Closed: ❑ Yes, ❑ NA
Clothes Dryer and Other Exhaust Appliances On: ❑ Yes, ❑ NA
(Exception: Do not operate whole house exhaust fans)
Interior Doors Closed: ❑ Yes, ❑ NA
(Exception: Do not close doors to rooms that have exhaust fans but no supply registers.)
Blower Door Being Used to Simulate Fireplace Flow: ❑ Yes, ❑ NA

COMBUSTION APPLIANCE ZONE (CAZ) TEST

Is There A Door From the CAZ to the Main Body of the House: ❑ Yes, ❑ No
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside: _____Pa
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside: _____Pa
With CAZ Door to Main Body Closed, CAZ Pressure with reference to Outside: _____Pa
Operate Furnace Blower.
With CAZ Door to Main Body Closed, CAZ Pressure with reference to Outside: _____Pa
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside: _____Pa

Recreate Conditions Which Caused the Greatest Negative Pressure in the CAZ

APPLIANCE TESTING

Water Heater: (Order of Testing Determined on Site.)
Fire the Water Heater.
Was the Water Heater Able to Establish Draft: ❑ Yes, ❑ No
Spillage After Two (2) Minutes: ❑ Yes, ❑ No
Draft After Five (5) Minutes _____Pa_____W.C.
Carbon Monoxide After Five (5) Minutes: _____/_____PPM

Furnace/Boiler/Space Heater: (Order of Testing Determined on Site.)
Fire the Heating Appliance.
Was the Heating Appliance Able to Establish Draft: ❑ Yes, ❑ No
Did Operation of the Heating Appliance Cause Spillage or Reduction in Draft for Any of the Other Appliances ❑ Yes, ❑ No
Spillage After Two (2) Minutes: ❑ Yes, ❑ No
Draft After Five (5) Minutes: _____Pa_____W.C.
Carbon Monoxide After Five (5) Minutes: _____/_____/_____/_____PPM

Notes:

Job Number:_____

PRIMARY HEAT SOURCE		PRE-INSP.	CONTRACTOR	POST-INSP.
1. Is fuel available/furnace on?		Yes No NA	Yes No NA	Yes No NA
2. Adjust fuel supply to control valve.			Repaired NA	
3. Adjust burner and gas input.			Repaired NA	
4. Adjust the pilot light and/or adjust combustible blower (for power blower).			Repaired NA	
5. Check the pressure regulator.			Replaced NA	
6. Check Temperature rise/within range on rating?		Yes No NA	Yes No NA	Yes No NA
7. Filter present & in good condition?		Yes No NA		
8. Filter Size?		_____	Replaced NA	Yes No NA
9. Belt needs replacement/adjustments?		Yes No NA	Yes No NA	Yes No NA
10. Blower housing and motor needs cleaning?		Yes No NA	Done NA	Yes No NA
11. Combustion Chamber needs cleaning?		Yes No NA	Done NA	Yes No NA
12. Cabinet needs cleaning?		Yes No NA	Done NA	Yes No NA
13. Heat exchanger needs cleaning?		Yes No NA	Done NA	Yes No NA
14. Burner Ports and Fire Tubes need cleaning?		Yes No NA	Done NA	Yes No NA
15. Problems with fan/limit controls?		Yes No NA	Repaired NA Replaced NA	Yes No NA
16. Problem with Thermostat?		Yes No NA	Repaired NA Replaced NA	Yes No NA
17. Venting system needs replacement or repair?		Yes No NA	Yes No NA	Yes No NA
18. Combustion/make-up air adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
19. Heating duct work present/adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
20. Return air duct work present/adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
21. Properly operating limit control/automatic fuel safety shut off and/or Boiler controls.		Yes No NA	Replaced NA	Yes No NA
22. Actual Input (clock the meter) kBtu?				
23. Problems with Heat Exchanger? How Tested?			Yes No	
24. **Oil information**: Oil filter present?		Yes No NA	Replaced NA	Yes No NA
25.	Oil Filter needs cleaning?	Yes No NA	Done NA	Yes No NA
26.	Nozzle Size?			
27.	Combustion Chamber in good condition?	Yes No NA	Repair/Replace Yes No NA	Yes No NA
28.	Smoke Reading?			
29.	Oil Pump pressure set at 100psi or per Manufacturer's recommendations.		Repair/Replace Yes No NA	
30.	Orifice replaced (if Necessary).		Done NA	Yes No NA

Note: Contractor must complete all entries including retesting when applicable. Comments:

Job Number:_____

REFRIGERATOR REPLACEMENT		
Existing Manufacturer:	Model No.:	Manual Defrost: (**Y**) (**N**) Includes Defrost Cycle: (**Y**) (**N**)
Height (inches):	Width (inches):	Depth (inches):
Size (CF): Location:	kWh/Yr:	Age:
Metering Minutes:	Meter Reading:	
Type of Audit: **NEAT (Y) (N), REDAT (Y) (N),**		Replacement Refrigerator **SIR**:
Comments:		

Location: Heated Space, Unheated Space, Unintentionally Heated **Age**: **1** = Less than 5 Years, **2** = 5 to 10 Years, **3** = 10 to 15 Years, **4** = More Than 15 Years

Replacement Manufacturer:	Model No.:		
Height (inches):	Width (inches):	Depth (inches):	Size (CF):

REFRIGERATOR REPLACEMENT COSTS		**Estimated Quantity**	**Estimated Cost ($)**	**Actual Quantity**	**Actual Cost ($)**
TOTAL REFRIGERATOR REPLACEMENT COSTS:					

TOTAL JOB COSTS **[ ] MAT [ ] LAB/MAT**		**Estimated Costs**	**Labor Costs**	_____ **Costs**	_____ **Costs**	**DOE Costs**	**Total Costs**
Health and Safety Costs (page 2)							
Air Sealing/Infiltration/Exfiltration Costs (page 4)							
Compact Flourescent Light Bulb Costs (page 4)							
Water Heater Costs (page 5)							
Wall Insulation Costs (page 5)							
Attic Insulation Costs (page 5)							
Additional Attic Insulation and/or Ventilation Costs (page 6)							
Foundation/Floor/Belly Insulation Costs (page 6)							
Duct/Pipe Insulation Costs (page 7)							
Duct Sealing/Repair/Replacement Costs (page 7)							
Storm Window Costs (page 7)							
Optional/Additional Wx Measures Costs (page 7)							
Incidental Repair Costs (page 7)							
Refrigerator Replacement Costs (page 11)							
JOB COST TOTALS							

Labor Costs Breakdown	**Estimated Costs**	**Labor Costs**	_____ **Costs**	_____ **Costs**	**DOE Costs**	**Total Costs**
If Private Contractor used, Total Labor Cost						
If Crews, Total Labor Hours						

FAMILY INDEPENDENCE AGENCY		Agency:_____
BUILDING CHECK AND JOB ORDER SHEET		Job Number:_____

Type of Audit	◯ **Weatherization Priorities**	◯ **Multi Family/Audit Approved, Number of Units Wx'd_____**

Client Information / Client's Last & First Name:	**Phone:**
Street:	**City:**
Contact Person / Landlord:	Contact Phone:
Directions to House and Special Conditions:	

Foundation Type: ◯ **Heated Foundation** ◯ **Unheated Foundation** ◯ **Non Vented Foundation** ◯ **Vented Foundation** ◯ **Slab**	**Air Conditioned** ◯ **Yes** ◯ **No**

Total Weatherization Costs:	**Total Material Costs:**	**Total Labor Cost/Hours:**
DOE Funds:	_____ **Funds:**	_____ **Funds:**

	Preinspection	Approved to Start	Job Started	Job Completed	Postinspection	Final Sign Off
Date:						
Initials:						

Insulation Certificate attached: ◯ Yes ◯ No ◯ NA

MEASURES	**Install Yes**	**(√) No**	**If No, Cite Reason:**
HEALTH & SAFETY:			
Smoke Detectors:			
Clothes Dryer Vent:			
Other:			
MEASURES PRIORITIES:			
Major Bypasses:			
Duct Sealing/Repair/Replacement:			
Duct Insulation:			
Attic Insulation (R19):			
Kneewall Insulation:			
Exterior Wall Insulation:			
Infiltration/Exfiltration:			
Compact Flourescent Light Bulbs:			
Bandjoist (Sillbox) Insulation:			
Floor Insulation:			
Perimeter Insulation:			
Attic Insulation (R30/38):			
Refrigerator Replacement (min **SIR 1.5**):			

ITEMIZED ADDITIONAL COSTS	Install Yes	(√) No		
Incidental Repairs:				

ALL UNITS	Install Yes	(√) No		
OPTIONAL MEASURES:				
Hot Water Heater Wrap:				
Low Flow Shower Head:				
Clock Setback Thermostat:				
Furnace Tune-up/Repair:				

HEALTH AND SAFETY EVALUATION/CLIENT NOTIFICATION

Structural Problems/Repairs Needed ◯ Yes ◯ No:

Wiring: Romex ◯ Yes ◯ No, Knob and Tube ◯ Yes ◯ No, Breakers or "S" Type Fuses ◯ Yes ◯ No:

Wiring Problems/Repairs Needed ◯ Yes ◯ No:

Indoor Air Quality Problems/Repairs Needed ◯ Yes ◯ No:

Other Health and Safety Problems/Repairs Needed ◯ Yes ◯ No:

CLIENTS AND OTHER INTERESTED PARTIES SHALL BE PROVIDED WRITTEN NOTICE OF HAZARDS IN ACCORDANCE WITH THE HEALTH AND SAFETY STANDARDS. A COPY SHALL BE MAINTAINED IN THE CLIENT/JOB FILE.

CLIENT **NOTIFIED IN WRITING** OF BELOW CONDITIONS (if existing):

Notice of Indoor Air Quality Concern ◯ Yes ◯ No, Comments:

Notice of Potentially Unsafe Condition ◯ Yes ◯ No, Comments:

Asbestos Notice ◯ Yes ◯ No, Comments:

Job Number:_____

Household Info.	Const. Type	Dwelling	Pilot Lights		
# of Persons (1)	Balloon Frame	Single Family	Relight Needed	yes	no
# of Smokers **(2)**	Platform	Duplex	Furnace		
# of Bedrooms **(3)**	Other	Multi Family	H20 Tank		
Comments:		# of Units	Kit. Stove		

First Floor	Length	X Width	=	sq ft X Height	(A) =		Cubic Ft.
Second Floor	Length	X Width	=	sq ft X Height	(B) =		Cubic Ft.
Other	Length	X Width .	=	sq ft X Height	(C) =		Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(D) =		Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(E) =		Cubic Ft.
Cond. Bsmt.	Length	X Width	=	sq ft X Height	(F) =		Cubic Ft.
Conditioned Area is A + B + C +D + E + F		Total	=	sq ft	Total House Volume	=	Cubic Ft.

BLOWER DOOR EVALUATION		**Existing Conditions/Sealing Levels/Testing**

Operational Exhaust Fans: ◯ Bathroom ◯ Kitchen ◯ Other, Location:

Properly Vented Clothes Dryer: ◯ YES ◯ NO, Describe:

MOISTURE: Excessive Moisture/I.A.Q. Problems (2) (4) ◯ YES ◯ NO, If Yes Describe:

Visual Review Done, ◯ Yes ◯ No Moisture/Biologicals Evident , ◯ Yes ◯ No, Location:

Clothes Dryer Vent Needed ◯ Yes ◯ No, Downspouts Needed ◯ Yes ◯ No, Exhaust Fan Needed ◯ Yes ◯ No

Roof Repair Needed ◯ Yes ◯ No, Roof Replacement Needed ◯ Yes ◯ No:

Other Moisture Related Work ◯ Yes ◯ No:

CFM PERSONS (P): 1200 + _____ (+300/EACH OCCUPANT OVER 4) = _____ + _____ SPEC. COND. (2) = _____CFM (P)
CFM BEDROOMS (BR): 1200 + _____ (+300/EACH BEDROOM OVER 3) = _____ + _____ SPEC. COND. (4) = _____CFM (BR)
CFM PERCENT (%): 100 - _____ ACH % REDUCTION (5) = ._____ x _____ Pre CFM = _____ CFM (%)
MINIMUM CFM: _____ (highest (P)/(BR), Don't seal below Minimum CFM). CFM GOAL _____ (higher of P/BR/%-CFM)
ACTUAL % REDUCTION: (PRE _____) - (POST_____) = (_____) / (PRE_____) = _____% REDUCTION If less than ACH% reduction (5), document why:_____

Indicate Door (s) Used for Fan Set Up:

Fan Set up: ◯ Pressurized ◯ Depressurized Low Flow Plate: ◯ ON ◯ OFF, Rings Used ◯ A, ◯ B, ◯ C

House Pressure (Pa)			Fan Pressure (Pa)			Air Flow/Cu. Ft. Per Min @ 50 Pa.			Air Changes Per Hour		
Pre	**Mid**	**Post**	**Pre**	**Mid**	**Post**	**Pre**	**Mid**	**Post**	**Pre**	**Mid**	**Post**

Comment:

NOTE: A MINIMUM OF 1200 CFM @ 50 PA IS REQUIRED
(1) PERSONS - NUMBER OF PERSONS NORMALLY LIVING IN THE HOUSE
(2) SMOKERS & / OR EXCESS MOISTURE / INDOOR AIR QUALITY PROBLEMS (WHICH WILL NOT BE CORRECTED), ADD ADDITIONAL CFM (300/SMOKER) TO" MINIMUM CFM" FOR "PERSONS".
(3) BEDROOMS - NUMBER OF BEDROOMS IN THE HOUSE (REGARDLESS OF CURRENT USE).
(4) PERMANENT MOISTURE / INDOOR AIR QUALITY PROBLEMS RELATIVE TO THE STRUCTURE. (I.E. FOUNDATION LEAKS, DRAIN PROBLEMS), ADD ADDITIONAL CFM TO "MINIMUM CFM" FOR "BEDROOMS".
(5) ACH % REDUCTION IS BASED ON PRE ACH: ACH 11-17/25%, ACH 18-22/35%, ACH 23+/40% (WFM II.IV.A.)

Job Number:_____

MAJOR BYPASS/INFILTRATION/EXFILTRATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
Major Bypasses:				
Infiltration/Exfiltration:				
TOTAL MAJOR BYPASS/INFILTRATION/EXFILTRATION COSTS:				

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

WALLS - EXISTING CONDITIONS

Wall Code	Length	Height	Area Sq. Ft.	Cavity Depth	Structural Problems		Wall Cvg. Problems		Moisture Problems		Wiring Problems		Live K & T Wire		Existing Insulation			
					Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Type	R

Recommend Insulation: ◯ Yes, ◯ No, ◯ NA, Comments:_____

Method Recommended: ◯ One Hole/Tubing; ◯ Two Hole; ◯ Siding Removal; ◯ Top Plate; ◯ Interior; Other_____

Client's permission (optional) to complete wall insulation as stated above, Client's Initials:

WALL INSULATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL WALL INSULATION COSTS:				

ADDITIONAL WALL INSULATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDITIONAL WALL INSULATION COSTS:				

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

ATTIC INSULATION/VENTILATION

Ceiling Area: Location	Width	Length	Sq.Ft. Area	Existing Insulation Y	N	Type/# Inches	R	Existing Ventilation Y	N	# Vents	Size	Location

A. Access: ◯ Existing, ◯ New. Location/Comments:_____

B. Heat producing sources requiring dam/barriers? ◯ Yes ◯ No. Quantity/types:_____, Client's permission (optional) to install new access, Client Initial: _____

C. Wiring in areas to be insulated? ◯ Yes ◯ No, K&T? ◯ Yes ◯ No, Wiring Problems? ◯ Yes ◯ No
Comments:_____

D. Moisture Problems? ◯ Yes ◯ No. Comments: _____

E. Structural Problems? ◯ Yes ◯ No. Comments:

ATTIC INSULATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ATTIC INSULATION COSTS:				

ATTIC VENTING REQUIRED

Existing soffit vents requiring treatment to prevent blockage? ◯ Yes ◯ No, If yes, note material needed:

Can soffit vents be installed? ◯ Yes ◯ No:

Attic Code	(A) Total Area Sq. Ft.	(B)Formula (300 or 600)	(C) Venting Required Sq. Ft. (A/B)	(D) Venting Required Sq. In. (Cx144)	(E) Existing Venting Sq. In.	New Venting Req'd Sq. In. (D-E)

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

Install New Vents in the following Location(s) - Designate for Each Attic Area (include vent types and sizes):

ADDITIONAL ATTIC INSULATION AND/OR VENTILATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDITIONAL ATTIC INSULATION AND/OR VENTILATION COSTS:					

FOUNDATION EXISTING CONDITIONS

Floor Area: Location	Width	Length	Sq.Ft. Area	Existing Insulation Y	N	Type/# Inches	R	Existing Ventilation Y	N	# Vents	Size	Location

A. Insulation Needed? ◯ Yes ◯ No. _____
Ground Cover Needed? ◯ Yes ◯ No. _____
B. For Perimeter: _____ Lineal feet X _____ Height of wall (add 2' for floors above frost line) = _____ Sq. Ft.
C. Joist Pockets: Open joist pockets? ◯ Yes ◯ No, depth: _____ Inches, 16 or 24 o.c.: _____, Joist Height: _____ Inches.
D. Access: ◯ Existing, ◯ New. Location/Comments: _____
_____, Client's permission (optional) to install new access, Client Initial: _____
E. Doors between heated and unheated areas? ◯ Yes ◯ No. If yes, describe locations/recommendations: _____

FOUNDATION AND/OR BAND JOIST INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL FOUNDATION AND/OR BAND JOIST INSULATION COSTS:					

FOUNDATION VENTING

Foundation Code	(A) Total Sq. Ft.	(B)Formula (1500)	(C) Venting Required Sq. Ft. (A/B)	(D) Venting Required Sq. In. (Cx144)	(E) Existing Venting Sq. In.	New Venting Req'd. Sq. In. (D-E)

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

Operable vents needed for perimeter insulation? ◯ Yes ◯ No

Number of vents needed, size, location, and/or comments:

ADDED FOUNDATION INSULATION AND/OR VENTILATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDED FOUNDATION INSUL. AND/OR VENTILATION COSTS:					

ALL COMBUSTION APPLIANCES		Pre-Insp.	Contractor	Post-Insp.
AT ANY POINT DURING INSPECTION AND TESTING, IF A PROBLEM INDICATES APPLIANCE SHOULD BE REPLACED, THE PROBLEM SHOULD BE DOCUMENTED AND FURTHER TESTING IS NOT NECESSARY				
Wiring problems?		Yes No NA	Repaired NA	Yes No NA
Scorch/burn marks, corrosion evident?		Yes No NA	Yes No NA	Yes No NA
Clearances from combustibles adequate?		Yes No NA	Yes No NA	Yes No NA
Floor or wall/fire protection needed?		Yes No NA	Yes No NA	Yes No NA
Problems with the metal/masonry venting system (i.e., clearances, deterioration, slope 1/4" min. rise/ft., obstruction)?		Yes No NA	Yes No NA	Yes No NA
CO in ambient air (Check by all combustion appliances. If 10 or more PPM, note recommended actions below***).	Furnace:_____	_____PPM	_____PPM	_____PPM
	Water Heater:_____	_____PPM	_____PPM	_____PPM
	Gas Dryer:_____	_____PPM	_____PPM	_____PPM
	Gas Stove:_____	_____PPM	_____PPM	_____PPM
	Other/Specify:_____	_____PPM	_____PPM	_____PPM
Furnace Draft Test:	(Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Water Heater Draft Test:	(Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Other _____ Draft Test:	(Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Did you detect any leaks (i.e., fuel, water, exhaust, steam)?		Yes No NA		
If yes, location of leak?		Yes No NA		
If yes, did you correct leak?			Repaired NA	Yes No NA
Does inspection of unit indicate it should be removed from service?		Yes No NA		
If yes, give reason(s):				
	Non-operational._____	Yes No NA	Yes No NA	Yes No NA
	Illegal-unvented (can't be vented)._____	Yes No NA	Yes No NA	Yes No NA
	No safety controls (can't be added)._____	Yes No NA	Yes No NA	Yes No NA
	Obvious crack/hole in heat exchanger._____	Yes No NA	Yes No NA	Yes No NA
	Leaking beyond repair._____	Yes No NA	Yes No NA	Yes No NA
	Other.	Yes No NA	Yes No NA	Yes No NA
Client provided with written notice?		Yes No NA	Yes No NA	Yes No NA
*** After testing unit(s), did you find anything to indicate that unit(s) should be tuned/repaired/replaced? Reasons/comments:		Yes No NA	Yes No NA	Yes No NA

Note: Contractor must complete all entries including retesting when applicable.

***All** **"Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

DRAFT - SPILLAGE - CO - TESTING CHECKLIST AND SUMMARY

SETUP

Heating Appliance and Water Heater Off:	❑ Yes
Furnace Filter Clean or Removed:	❑ Yes
All Exterior Windows and Doors Closed:	❑ Yes
Fireplace or Wood Stove Dampers Closed:	❑ Yes, ❑ NA
Clothes Dryer and Other Exhaust Appliances On: (Exception: Do not operate whole house exhaust fans)	❑ Yes, ❑ NA
Interior Doors Closed: (Exception: Do not close doors to rooms that have exhaust fans but no supply registers.)	❑ Yes, ❑ NA
Blower Door Being Used to Simulate Fireplace Flow:	❑ Yes, ❑ NA

COMBUSTION APPLIANCE ZONE (CAZ) TEST

Is There A Door From the CAZ to the Main Body of the House:	❑ Yes, ❑ No
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside:	_____Pa
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside:	_____Pa
With CAZ Door to Main Body Closed, CAZ Pressure with reference to Outside:	_____Pa
Operate Furnace Blower.	
With CAZ Door to Main Body Closed, CAZ Pressure with reference to Outside:	_____Pa
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside:	_____Pa

Recreate Conditions Which Caused the Greatest Negative Pressure in the CAZ

APPLIANCE TESTING

Water Heater:	(Order of Testing Determined on Site.)
Fire the Water Heater.	
Was the Water Heater Able to Establish Draft:	❑ Yes, ❑ No
Spillage After Two (2) Minutes:	❑ Yes, ❑ No
Draft After Five (5) Minutes	_____Pa_____W.C.
Carbon Monoxide After Five (5) Minutes:	_____/_____PPM

Furnace/Boiler/Space Heater:	(Order of Testing Determined on Site.)
Fire the Heating Appliance.	
Was the Heating Appliance Able to Establish Draft:	❑ Yes, ❑ No
Did Operation of the Heating Appliance Cause Spillage or Reduction in Draft for Any of the Other Appliances	❑ Yes, ❑ No
Spillage After Two (2) Minutes:	❑ Yes, ❑ No
Draft After Five (5) Minutes:	_____Pa_____W.C.
Carbon Monoxide After Five (5) Minutes:	_____/_____/_____/_____PPM

Notes:

Job Number:_____

NOTE: When installing a **New Furnace** (complete appropriate sections above) provide **MANUFACTURER**_____

MODEL _____ **FUEL TYPE**_____ **BTUs**_____

PERMIT #_____ **PERMIT JURISDICTION:**_____ ❒ **Or Copy Attached**

FURNACE SIZED: ❒ **Per Manual J,** ❒ **Per NEAT - Note Candidate/Weatherization Measures turned off to size:**

PRIMARY HEAT SOURCE		**PRE-INSP.**	**CONTRACTOR**	**POST-INSP.**
1. Is fuel available/furnace on?		Yes No NA	Yes No NA	Yes No NA
2. Adjust fuel supply to control valve.			Repaired NA	
3. Adjust burner and gas input.			Repaired NA	
4. Adjust the pilot light and/or adjust combustible blower (for power blower).			Repaired NA	
5. Check the pressure regulator.			Repaired NA Replaced NA	
6. Check Temperature rise/within range on rating?		Yes No NA	Yes No NA	Yes No NA
7. Filter present & in good condition?		Yes No NA		
8. Filter Size?		_____	Replaced NA	Yes No NA
9. Blower housing and motor needs cleaning?		Yes No NA	Done NA	Yes No NA
10. Combustion Chamber needs cleaning?		Yes No NA	Done NA	Yes No NA
11. Cabinet needs cleaning?		Yes No NA	Done NA	Yes No NA
12. Heat exchanger needs cleaning?		Yes No NA	Done NA	Yes No NA
13. Burner Ports and Fire Tubes need cleaning?		Yes No NA	Done NA	Yes No NA
14. Problems with fan/limit controls?		Yes No NA	Repaired NA Replaced NA	Yes No NA
15. Problem with Thermostat?		Yes No NA	Repaired NA Replaced NA	Yes No NA
16. Are tiles/glass missing, broken, or in need of repair?		Yes No NA	Repaired NA Replaced NA	Yes No NA
17. Belts need replacement/adjustments?		Yes No NA	Repaired NA Replaced NA	Yes No NA
18. Combustion/make-up air adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
19. Heating duct work present/adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
20. Return air duct work present/adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
21. Net stack temperature (Flue gas temperature minus room temperature).		_____F	_____F	_____F
22. Flue gas content _____Oxygen (O2) or_____Carbon Dioxide (CO2)		_____%	_____%	_____%
23. Steady State Efficiency (after tune-up SSE within 5% of Manufacturer's AFUE or 70% required)		Yes No NA _____%	Yes No NA _____%	Yes No NA _____%
24. CO in flue gasses at top of heat exchanger (check each port)? Maximum 100 PPM. 400 PPM acceptable at Start up:				
	Port 1	_____PPM	_____PPM	_____PPM
	Port 2	_____PPM	_____PPM	_____PPM
	Port 3	_____PPM	_____PPM	_____PPM
	Port 4	_____PPM	_____PPM	_____PPM
	Port 5	_____PPM	_____PPM	_____PPM
	Port 6	_____PPM	_____PPM	_____PPM
25. Properly operating limit control/automatic fuel safety shut off and/or Boiler controls.		Yes No NA	Replaced NA	Yes No NA

Note: Contractor must complete all entries including retesting when applicable.

Job Number:_____

26. Actual Input (clock the meter) kBtu?			
27. Problems with Heat Exchanger? How tested?		Yes No NA	
28. Venting system needs replacement or repair?	Yes No NA	Yes No NA	Yes No NA
29. **Oil information**: Oil filter present?	Yes No NA	Replaced NA	Yes No NA
30. Oil Filter needs cleaning?	Yes No NA	Done NA	Yes No NA
31. Nozzle Size?			
32. Combustion Chamber in good condition?	Yes No NA	Repair/Replace Yes No NA	Yes No NA
33. Smoke Reading?			
34. Oil Pump pressure set at 100psi or per Manufacturer's recommendations.		Repair/Replace Yes No NA	
35. Orifice replaced (if Necessary).		Done NA	Yes No NA

Note: Contractor must complete all entries including retesting when applicable. Comments:

HEALTH AND SAFETY COSTS*		**Estimated Quantity**	**Estimated Cost ($)**	**Actual Quantity**	**Actual Cost ($)**
TOTAL HEALTH AND SAFETY COSTS:					

DUCT SEALING/REPAIR/REPLACEMENT COSTS*		**Estimated Quantity**	**Estimated Cost ($)**	**Actual Quantity**	**Actual Cost ($)**
TOTAL DUCT SEALING/REPAIR/REPLACEMENT COSTS:					

DUCT INSULATION COSTS*		**Estimated Quantity**	**Estimated Cost ($)**	**Actual Quantity**	**Actual Cost ($)**
TOTAL DUCT INSULATION COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

COMPACT FLOURESCENT LIGHT BULB COSTS		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL COMPACT FLOURESCENT LIGHT BULBS COSTS:					

INCIDENTAL REPAIR COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL INCIDENTAL REPAIR COSTS:					

OPTIONAL WEATHERIZATION MEASURES COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL OPTIONAL WEATHERIZATION MEASURES COSTS:					

REFRIGERATOR REPLACEMENT

Existing Manufacturer:	Model No.:	Manual Defrost: (**Y**) (**N**)	Includes Defrost Cycle: (**Y**) (**N**)
Height (inches):	Width (inches):	Depth (inches):	
Size (CF):	Location:	kWh/Yr:	Age:
Metering Minutes:	Meter Reading:		
Type of Audit: **NEAT (Y) (N), REDAT (Y) (N),**		Replacement Refrigerator **SIR**:	
Comments:			

Location: Heated Space, Unheated Space, Unintentionally Heated **Age**: **1** = Less than 5 Years, **2** = 5 to 10 Years, **3** = 10 to 15 Years, **4** = More Than 15 Years

Replacement Manufacturer:	Model No.:		
Height (inches):	Width (inches):	Depth (inches):	Size (CF):

REFRIGERATOR REPLACEMENT COSTS		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL REFRIGERATOR REPLACEMENT COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

TOTAL JOB COSTS **[ ] MAT [ ] LAB/MAT**	**Estimated Costs**	**Actual Costs**	**_____ Costs**	**_____ Costs**	**DOE Costs**	**Total Costs**
Major Bypass/Infiltration/Exfiltration Costs (page 4)						
Wall Insulation Costs (page 5)						
Additional Wall Insulation Costs (page 5)						
Attic Insulation Costs (page 6)						
Additional Attic Insul. and/or Ventilation costs (page 7)						
Foundation and/or Band Joist Insul. Costs (page 7)						
Added Foundation and/or Ventilation Costs (page 8)						
Health and Safety Costs (page 11)						
Duct Sealing/Repair/Replacement Costs (page 11)						
Duct Insulation Costs (page 11)						
Compact Flourescent Light Bulb Costs (page 12)						
Incidental Repair Costs (page 12)						
Optional Weatherization Measures Costs (page 12)						
Refrigerator Replacement Costs (page 12)						
JOB COST TOTALS						

***Identify Other Measures/Costs required per approved Multi Family Audit.

LABOR COSTS BREAKDOWN	**Estimated Costs**	**Actual Costs**	**_____ Costs**	**_____ Costs**	**DOE Costs**	**Total Costs**
If Private Contractor used, Total Labor Cost						
If Crews, Total Labor Hours						

MULTI UNIT COST BREAKOUT

UNIT/ JOB NUMBER	**MATERIAL COSTS**	**CONTRACT LABOR**	**CREW LABOR $/HOURS**
Unit Number:_____	$	$	$ / Hours
Unit Number:_____	$	$	$ / Hours
Unit Number:_____	$	$	$ / Hours
Unit Number:_____	$	$	$ / Hours

FAMILY INDEPENDENCE AGENCY

BUILDING CHECK AND JOB ORDER SHEET

Agency:_____

Job Number:_____

Type of Audit ◯ **Neat** - **Version**_____ ◯ **Weatherization Priorities** ◯ **Multi Family** **(2 - 4 Units), Number Wx'd**_____

Job Modifications in NEAT Setup/Parameters:

Client Information / Client's Last & First Name: **Phone:**

Street: City: State: Michigan Zip:

Contact Person / Landlord: Contact Phone:

Directions to House and Special Conditions:

Foundation Type: ◯ **Heated Foundation** ◯ **Unheated Foundation** ◯ **Non Vented Foundation** ◯ **Vented Foundation** ◯ **Slab**

Air Conditioned ◯ **Yes** ◯ **No**

Total Weatherization Costs: **Total Material Costs:** **Total Labor Cost/Hours:**

DOE Funds: _____ **Funds:** _____ **Funds:**

	Preinspection	Approved to Start	Job Started	Job Completed	Postinspection	Final Sign Off
Date:						
Initials:						

Insulation Certificate attached: ◯ Yes ◯ No ◯ NA

PRIORITIES/NEAT MEASURES	**Install Yes**	**(√) No**	**If No, Cite Reason:**
HEALTH & SAFETY:			
Smoke Detectors:			
Clothes Dryer Vent:			
Other:			
MEASURES PRIORITIES:			
Major Bypasses:			
Duct Sealing/Repair/Replacement:			
Duct Insulation:			
Attic Insulation:			
Kneewall Insulation:			
Exterior Wall Insulation:			
Infiltration/Exfiltration:			
Compact Flourescent Light Bulbs:			
Bandjoist (Sillbox) Insulation:			
Floor Insulation:			
Perimeter Insulation:			
Refrigerator Replacement (min **SIR 1.5**):			

Job Number:_____

ADDITIONAL NEAT MEASURES:	Yes	No	If No, Cite Reason:	*Pilot Agencies Only
Storm Windows:				
Flame Retention Burners:				
Heating System Replacement:				

ITEMIZED ADDITIONAL COSTS	Install Yes	(√) No	If No, Cite Reason:	
Incidental Repairs:				
Miscellaneous:				

ALL UNITS	Install Yes	(√) No	If No, Cite Reason:	
OPTIONAL MEASURES:				
Hot Water Heater Wrap:				
Low Flow Shower Head:				
Clock Setback (Smart) Thermostat:				
Furnace Tune-up/Repair:				

HEALTH AND SAFETY EVALUATION/CLIENT NOTIFICATION	
Structural Problems/Repairs Needed ◯ Yes ◯ No:	
Wiring: Romex ◯ Yes ◯ No, Knob and Tube ◯ Yes ◯ No, Breakers or "S" Type Fuses ◯ Yes ◯ No:	
Wiring Problems/Repairs Needed ◯ Yes ◯ No:	
Indoor Air Quality Problems/Repairs Needed ◯ Yes ◯ No:	
Other Health and Safety Problems/Repairs Needed ◯ Yes ◯ No:	

CLIENTS AND OTHER INTERESTED PARTIES SHALL BE PROVIDED WRITTEN NOTICE OF HAZARDS IN ACCORDANCE WITH THE HEALTH AND SAFETY STANDARDS. A COPY SHALL BE MAINTAINED IN THE CLIENT/JOB FILE.

CLIENT **NOTIFIED IN WRITING** OF BELOW CONDITIONS (if existing):
Notice of Indoor Air Quality Concern ◯ Yes ◯ No, Comments:
Notice of Potentially Unsafe Condition ◯ Yes ◯ No, Comments:
Asbestos Notice ◯ Yes ◯ No, Comments:

Job Number:_____

Household Info.	Const. Type	Dwelling	Pilot Lights		
# of Persons (1)	Balloon Frame	Single Family	Relight Needed	yes	no
# of Smokers **(2)**	Platform	Duplex	Furnace		
# of Bedrooms **(3)**	Other	Multi Family	H20 Tank		
Comments:		# of Units	Kit. Stove		

Number of Conditioned Stories:	**Living Space Floor Area (Sq. Ft.)**

First Floor	Length	X Width	=	sq ft X Height	(A) =	Cubic Ft.
Second Floor	Length	X Width	=	sq ft X Height	(B) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(C) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(D) =	Cubic Ft.
Other	Length	X Width	=	sq ft X Height	(E) =	Cubic Ft.
Cond. Bsmt.	Length	X Width	=	sq ft X Height	(F) =	Cubic Ft.
Conditioned Area is A + B + C +D + E + F		Total	=	sq ft	Total House Volume =	Cubic Ft.

BLOWER DOOR EVALUATION		**Existing Conditions/Sealing Levels/Testing**

Operational Exhaust Fans: ◯ **Bathroom** ◯ **Kitchen** ◯ **Other, Location:**

Properly Vented Clothes Dryer: ◯ **YES** ◯ **NO, Describe:**

MOISTURE: Excessive Moisture/I.A.Q. Problems (2) (4) ◯ **YES** ◯ **NO, If Yes Describe:**

Visual Review Done, ◯ **Yes** ◯ **No Moisture/Biologicals Evident ,** ◯ **Yes** ◯ **No, Location:**

Clothes Dryer Vent Needed ◯ **Yes** ◯ **No, Downspouts Needed** ◯ **Yes** ◯ **No, Exhaust Fan Needed** ◯ **Yes** ◯ **No**

Roof Repair Needed ◯ **Yes** ◯ **No, Roof Replacement Needed** ◯ **Yes** ◯ **No:**

Other Moisture Related Work ◯ **Yes** ◯ **No:**

CFM PERSONS (P): 1200 + _____ **(+300/EACH OCCUPANT OVER 4) =** _____ **+** _____ **SPEC. COND. (2) =** _____**CFM (P)**
CFM BEDROOMS (BR): 1200 + _____ **(+300/EACH BEDROOM OVER 3) =** _____ **+** _____ **SPEC. COND. (4) =** _____**CFM (BR)**
CFM PERCENT (%): 100 - _____ **ACH % REDUCTION (5) = .**_____ **x** _____ **Pre CFM =** _____ **CFM (%)**
MINIMUM CFM: _____ **(highest (P)/(BR), Don't seal below Minimum CFM). CFM GOAL** _____ **(higher of P/BR/%-CFM)**
ACTUAL % REDUCTION: (PRE _____**) - (POST**_____**) = (**_____**) / (PRE**_____**) =** _____**% REDUCTION If less than ACH% reduction (5), document why:**_____

Indicate Door (s) Used for Fan Set Up:

Fan Set up: ◯ **Pressurized** ◯ **Depressurized Low Flow Plate:** ◯ **ON** ◯ **OFF, Rings Used** ◯ **A,** ◯ **B,** ◯ **C**

House Pressure (Pa)			Fan Pressure (Pa)			Air Flow/Cu. Ft. Per Min @ 50 Pa.			Air Changes Per Hour		
Pre	**Mid**	**Post**	**Pre**	**Mid**	**Post**	**Pre**	**Mid**	**Post**	**Pre**	**Mid**	**Post**

Comment:

Pre-Retrofit Air Leakage Rate from Blower Door (CFM):_____ **@ 50 Pascals**

Estimated Post-Retrofit Air Leakage Rate from Blower Door (CFM):_____ **@ 50 Pascals (Use CFM Goal Above)**

NOTE: A MINIMUM OF 1200 CFM @ 50 PA IS REQUIRED
(1) PERSONS - NUMBER OF PERSONS NORMALLY LIVING IN THE HOUSE
(2) SMOKERS & / OR EXCESS MOISTURE / INDOOR AIR QUALITY PROBLEMS (WHICH WILL NOT BE CORRECTED), ADD ADDITIONAL CFM (300/SMOKER) TO" MINIMUM CFM" FOR "PERSONS".
(3) BEDROOMS - NUMBER OF BEDROOMS IN THE HOUSE (REGARDLESS OF CURRENT USE).
(4) PERMANENT MOISTURE / INDOOR AIR QUALITY PROBLEMS RELATIVE TO THE STRUCTURE. (I.E. FOUNDATION LEAKS, DRAIN PROBLEMS), ADD ADDITIONAL CFM TO "MINIMUM CFM" FOR "BEDROOMS".
(5) ACH % REDUCTION IS BASED ON PRE ACH: ACH 11-17/25%, ACH 18-22/35%, ACH 23+/40% (WFM II.IV.A.)

Job Number:_____

MAJOR BYPASS/INFILTRATION/EXFILTRATION COSTS*	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
Major Bypasses:				
Infiltration/Exfiltration:				
TOTAL MAJOR BYPASS/INFILTRATION/EXFILTRATION COSTS:				

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

WALLS - EXISTING CONDITIONS

Wall Code	Length	Height	Cavity Depth	Structural Problems		Wall Cvg. Problems		Moisture Problems		Wiring Problems		Live K & T Wire		Comments
				Y	N	Y	N	Y	N	Y	N	Y	N	

Recommend Insulation: ◯ Yes, ◯ No, ◯ NA, Comments:_____

Method Recommended: ◯ One Hole/Tubing; ◯ Two Hole; ◯ Siding Removal; ◯ Top Plate; ◯ Interior; ◯ Other_____

Client's permission (optional) to complete wall insulation as stated above, Client Initial:_____

NEAT - EXTERIOR WALLS

Wall Code	Wall Dir.	Wall Area (sq. ft.)	Meas. No.	Wall Exp.	Ext. Type	Wall Type	Existing Insulation		Added Insulation		Comments
							Type	R	Type	Added Cost	

Wall Code: Agency Generated (i.e. **N1**, **N2**, **S1**, **E1**, etc.).
Wall Direction/Orientation: **N** = North; **E** = East; **S** = South; **W** = West
Wall Exposure: **E** = Exposed; **B** = Buffered; **A** = Unconditioned Attic
Exterior Type: **1** = Wood, Masonite; **2** = Aluminum, Steel, Vinyl **3**= Stucco; **4** = Brick, Stone; **5** = None; **6** = Other
Wall type: **1** = Balloon Frame; **2** = Platform Frame; **3** = Masonry, Stone; **4** = Concrete Block; **5** = Adobe; **6** = Other
Insulation Type: **0** = None; **1** = Blown Cellulose; **2** = Blown Fiberglass; **3** = Rockwool; **4** = Fiberglass Batts; **5** = Polystyrene Board; **6** = Other.
Added Insulation Type: **0** = None; **1** = Blown Cellulose; **2** = F/glass Batt

Job Number:_____

WALL INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL WALL INSULATION COSTS:					

ADDITIONAL WALL INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDITIONAL WALL INSULATION COSTS:					

NEAT - WINDOWS

		Windows						Retrofit Storm Windows			
Wdw Code	Wall Code	No. of Wdws	Frame Type	Glazing Type	Retro Status	Leak	Shaded %	Width (in.)	Height (in.)	Cost ($)*	Comments
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					
					Opt.	Tight**					

Wdw Code: Agency Generated (i.e. **WD1**, **WD2**, etc.).
Wall Code: Is keyed to **NEAT - Exterior Walls** coding entered.
Frame Type: **1** = Wood, Vinyl; **2** = Metal; **3** = Improved Metal with Thermal Break.
Glazing Type: **1** = Single; **2** = Single With Wood Storm; **3** = Single With Metal Storm; **4** = Double Pane; **5** = Single With Bad Storm.
Shaded Percentage: Example: **20%** = Eaves; **100%** = Porch.
Cost: Enter Cost Only If Other Than Default Cost, which Includes UP TO 101United Inches.
Note: If Storms over 101 united inches, use actual cost or estimated $1.00/1.50 per united inch.

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

****Tight - based on Infiltration/Exfiltration issues being addressed.**

Job Number:_____

STORM WINDOWS COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL STORM WINDOW COSTS:					

NEAT - DOORS

		Door			Storm Doors			
Door Code	Wall Code	Door Type	No. of Doors	Area (sq. ft.)	Condi-tion	Width (in.)*	Height (in.)*	Comments

Door Code: Agency Generated (i.e. **DR1**, **DR2**, etc.).
Wall Code: Is keyed to **NEAT - Exterior Walls** coding entered.
Door Type: **1** = Wood, Hollow Core; **2** = Wood, Solid Core; **3** = Steel, Insulated; **4** = Single (Pane) Sliding Glass; **5** = Double (Pane) Sliding Glass.
Area: Standard Door Area is 20 Square Feet.
Condition: **1** = Adequate; **2** = Deteriorated; **3** = None.
*Storm Doors Sizes are Optional

ATTIC - EXISTING CONDITIONS

Attic	Accessible				Moisture Problems		Structural Problems		Wiring Problems		K & T		Heat Sources,
Code	Y	N	Length	Width	Y	N	Y	N	Y	N	Y	N	Quantity, Type(s), Location(s)

Client's permission (optional) to install attic access? ◯ Yes, ◯ No, ◯ NA, Location: _____ Initials: _____
Client's permission (optional) to insulate on top of floor? ◯ Yes, ◯ No, ◯ NA, Location: Initials:

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

NEAT - UNFINISHED ATTIC

				Exist. Insul.		Additional Insul.				
Attic Code	Attic Type	Joist Space (in.)	Floor Area (sq.ft.)	Insul Type	Depth (in.)	Insul Type	Maximum Depth (in.)	Additional Installation Cost	Comments	Meas. No.

Attic Code: Agency Generated (i.e. **A1**, **A2**, etc.).
Type: **1** = Unfloored; **2** = Floored; **3** = Cathedral/Flat.
Joist Space: Default Value = **24** Inches.
Existing Insulation Type **0** = None; **1** = Blown Cellulose; **2** = Blown Fiberglass; **3** = Blown Rockwool; **4** = Fiberglass Batts; **5** = Other
Additional Insulation Type: **0** = None; **1** = Blown Cellulose; **2** = Blown Fiberglass; **3** = F/glass Batt; **4** = User Type 2.
Maximum Depth: Press "**ENTER**" if Unlimited (should be unlimited unless depth is restricted by construction).

NEAT - FINISHED ATTIC AREAS

			Exist. Insul.		Additional Insul.				
Attic Code	Attic Type	Area (sq. ft.)	Insul Type	Depth (in.)	Meas. No.	Insul Type	Maximum Depth (in.)	Additional Installation Cost	Comments
Outer Ceiling Joist									
Collar Beam									
Kneewall	XXX								
Roof Rafter	XXX								

Outer Ceiling Joist, Collar Beam Type: **1** = Unfloored; **2** = Floored.
Existing Insulation Type: **0** = None; **1** = Blown Cellulose; **2** = Blown Fiberglass; **3** = Blown Rockwool; **4** = Fiberglass Batts; **5** = Other
Additional Insulation Type: **0** = None; **1** = Blown Cellulose, **2** = Blown Fiberglass; **3** = F/glass Batt; **4** = User Type 2.
Maximum Depth: Press "**ENTER**" if Unlimited (should be unlimited unless depth is restricted by construction).

ATTIC INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ATTIC INSULATION COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

ATTIC VENTING REQUIRED	

Existing soffit vents requiring treatment to prevent blockage? ◯ Yes ◯ No, If yes, note material needed:

Can soffit vents be installed? ◯ Yes ◯ No:

Existing vents? ◯ Yes ◯ No, If yes, indicate type and size for each attic area:

Total area of existing vents/attic area:

Attic Code	(A) Total Area Sq. Ft.	(B) Formula (300 or 600)	(C) Venting Required Sq. Ft. (A/B)	(D) Venting Required Sq. In. (Cx144)	(E) Existing Venting Sq. In.	New Venting Req'd Sq. In. (D-E)

Install New Vents in the following Location(s) - Designate for Each Attic Area (include vent types and sizes):

ADDITIONAL ATTIC INSULATION AND/OR VENTILATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDITIONAL ATTIC INSULATION AND/OR VENTILATION COSTS:					

FOUNDATION - EXISTING CONDITIONS	

Found. Space Code	Length	Width	Joist Height	Joist Spacing O.C.	Ground Cover Needed Y	Ground Cover Needed N	Access Needed Y	Access Needed N	Comments

Client's Permission (optional) to install access? ◯ Yes, ◯ No, ◯ NA, Location(s): _____ Initials: _____

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

NEAT - FOUNDATION SPACES

			Floor		Perimeter		Wall					
Found Code	Type	Insul. Mode	Floor Area (sq.ft.)	Floor Insul R	Perim Length (ft.)	BJ % Expos	Meas. No.	Wall Hgth (ft.)	Perim. % Expos	Wall Insul R	Added Cost	Comments

Found. Code: Agency Generated (i.e. **F1**, **F2**, etc.).
Type: **C** = Conditioned; **N** = Non-condit'd; **V** = Vented non-condit'd; **U** = Unintentionally condit'd; **S** = Slab, uninsul'd; **I** = Slab, Insul'd; **E** = Exposed Floor.
Wall Hgth Total: Add 2' if not below the frost line. **Insulation Mode:** **0 =**None; **1 =** Floor or Wall; **2 =** Floor Only; **3 =** Wall Only.

FOUNDATION AND/OR BAND JOIST INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL FOUNDATION AND/OR BAND JOIST INSULATION COSTS:					

FOUNDATION VENTING

Existing vents? ◯ Yes ◯ No, If yes, indicate type, size, and location(s):

Total area of existing vents/foundation area:

Foundation Code	(A) Total Area Sq. Ft.	(B) Formula (1500)	(C) Venting Required Sq. Ft. (A/B)	(D) Venting Required Sq. In. (Cx144)	(E) Existing Venting Sq. In.	New Venting Req'd. Sq. In (D-E)

Operable vents needed for perimeter insulation, ◯ Yes ◯ No

Number of vents needed, size, location, and/or comments:

ADDED FOUNDATION INSULATION AND/OR VENTILATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDED FOUNDATION INSUL. AND/OR VENTILATION COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

NEAT - AIR CONDITIONERS

Unit Code	Unit Type	Size (kBtu)	Area Cooled (sq. ft).	SEER	Year bght	Manufacturer	Model	Comments

Unit Type: **1** = Central; **2** = Window; **3** = Heat Pump; **4** = Evaporative Cooler.

ALL COMBUSTION APPLIANCES

AT ANY POINT DURING INSPECTION AND TESTING, IF A PROBLEM INDICATES APPLIANCE SHOULD BE REPLACED, THE PROBLEM SHOULD BE DOCUMENTED AND FURTHER TESTING IS NOT NECESSARY

	Pre-Insp.	Contractor	Post-Insp.
Wiring problems?	Yes No NA	Repaired NA	Yes No NA
Scorch/burn marks, corrosion evident?	Yes No NA	Yes No NA	Yes No NA
Clearances from combustibles adequate?	Yes No NA	Yes No NA	Yes No NA
Floor or wall/fire protection needed?	Yes No NA	Yes No NA	Yes No NA
Problems with the metal/masonry venting system (i.e., clearances, deterioration, slope 1/4" min. rise/ft., obstruction)?	Yes No NA	Yes No NA	Yes No NA
CO in ambient air (Check by all combustion appliances. If 10 or more PPM, note recommended actions below***). Furnace:_____	_____PPM	_____PPM	_____PPM
Water Heater:_____	_____PPM	_____PPM	_____PPM
Gas Dryer:_____	_____PPM	_____PPM	_____PPM
Gas Stove:_____	_____PPM	_____PPM	_____PPM
Other/Specify:_____	_____PPM	_____PPM	_____PPM
Furnace Draft Test (Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Water Heater Draft Test (Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Other_____Draft Test (Pre_____, Post_____) Satisfactory?	Yes No NA	Yes No NA	Yes No NA
Did you detect any leaks (i.e., fuel, water, exhaust, steam)?	Yes No NA		
If yes, location of leak?	Yes No NA		
If yes, did you correct leak?		Repaired NA	Yes No NA
Does inspection of unit indicate it should be removed from service?	Yes No NA		
If yes, give reason(s):			
Non-operational._____	Yes No NA	Yes No NA	Yes No NA
Illegal-unvented (can't be vented)._____	Yes No NA	Yes No NA	Yes No NA
No safety controls (can't be added)._____	Yes No NA	Yes No NA	Yes No NA
Obvious crack/hole in heat exchanger._____	Yes No NA	Yes No NA	Yes No NA
Leaking beyond repair._____	Yes No NA	Yes No NA	Yes No NA
Other:		Yes No NA	Yes No NA
Client provided with written notice?	Yes No NA	Yes No NA	Yes No NA
*** After testing unit(s), did you find anything to indicate that unit(s) should be tuned/repaired/replaced? Reasons/comments:	Yes No NA	Yes No NA	Yes No NA

NOTE: When installing a **New Furnace** (complete appropriate sections above) provide **MANUFACTURER**_____

MODEL _____ **FUEL TYPE**_____ **BTUs**_____

PERMIT #_____ **PERMIT JURISDICTION:**_____ ❒ **Or Copy Attached**

FURNACE SIZED: ❒ **Per Manual J,** ❒ **Per NEAT - Note Candidate/Weatherization Measures turned off to size:**

Note: Contractor must complete all entries including retesting when applicable.

Job Number:_____

DRAFT - SPILLAGE - CO - TESTING CHECKLIST AND SUMMARY

SETUP

Heating Appliance and Water Heater Off: ❑ Yes
Furnace Filter Clean or Removed: ❑ Yes
All Exterior Windows and Doors Closed: ❑ Yes
Fireplace or Wood Stove Dampers Closed: ❑ Yes, ❑ NA
Clothes Dryer and Other Exhaust Appliances On: ❑ Yes, ❑ NA
(Exception: Do not operate whole house exhaust fans)
Interior Doors Closed: ❑ Yes, ❑ NA
(Exception: Do not close doors to rooms that have exhaust fans but no supply registers.)
Blower Door Being Used to Simulate Fireplace Flow: ❑ Yes, ❑ NA

COMBUSTION APPLIANCE ZONE (CAZ) TEST

Is There A Door From the CAZ to the Main Body of the House: ❑ Yes, ❑ No
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside: _____Pa
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside: _____Pa
With CAZ Door to Main Body Closed, CAZ Pressure with reference to Outside: _____Pa
Operate Furnace Blower.
With CAZ Door to Main Body Closed, CAZ Pressure with reference to Outside: _____Pa
With CAZ Door to Main Body Open, CAZ Pressure with reference to Outside: _____Pa

Recreate Conditions Which Caused the Greatest Negative Pressure in the CAZ

APPLIANCE TESTING

Water Heater: (Order of Testing Determined on Site.)
Fire the Water Heater.
Was the Water Heater Able to Establish Draft: ❑ Yes, ❑ No
Spillage After Two (2) Minutes: ❑ Yes, ❑ No
Draft After Five (5) Minutes _____Pa_____W.C.
Carbon Monoxide After Five (5) Minutes: _____/_____PPM

Furnace/Boiler/Space Heater: (Order of Testing Determined on Site.)
Fire the Heating Appliance.
Was the Heating Appliance Able to Establish Draft: ❑ Yes, ❑ No
Did Operation of the Heating Appliance Cause Spillage or Reduction in Draft for Any of the Other Appliances ❑ Yes, ❑ No
Spillage After Two (2) Minutes: ❑ Yes, ❑ No
Draft After Five (5) Minutes: _____Pa_____W.C.
Carbon Monoxide After Five (5) Minutes: _____/_____/_____/_____PPM

Notes:

Job Number:_____

NEAT - HEATING SYSTEMS

Primary System Code:	**Primary Equipment Type:**	**Secondary System Code:**
Primary Fuel Type:	**Smart Thermostat Existing (Y/N):**	**Secondary Equipment Type:**
Location:		**Secondary System Fuel Type:**
Primary System % of Heat Supplied:	**Secondary System % of Heat Supplied:**	**Secondary System Efficiency:**
Comments:		

System Code: Agency Generated (i.e. **HS1**, **HS2**, etc.).
Equipment Type: **1** = Gravity Furnace; **2** = Forced-air Furnace; **3** = Steam Boiler; **4** = Hot Water Boiler; **5** = Fixed Electric Resistance; **6** = Portable Electric Resistance; **7** = Heat Pump; **8** = Unvented Space Heater; **9** = Vented Space Heater; **0** = Other.
Fuel Type: **1** = Natural Gas; **2** = Oil; **3** = Electricity; **4** = Propane; **5** = Wood; **6** = Coal; **7** = Kerosene.
Location: **1** = Heated; **2** = Unheated; **3** = Unintentionally Heated.
Note: Use the appropriate form depending on the fuel type and heating system type.

NEAT - PRIMARY FURNACE -BOILER, GAS/PROPANE FUELED

Manufacturer:		Model Number:
Input Rating: (kBtu/h)	Output Capacity: (kBtu/h)	Steady-State Efficiency: (%)
Pilot Light Present? (Y/N)	Pilot On In Summer? (Y/N)	IID Present? (Y/N)
Power Burner Present? (Y/N)	Vent Damper Present? (Y/N))	Vent Damper Recommended? **N**
Vent Damper Diameter (in.) **NA**	Furnace General Condition:	Tuneup/Replacement Status:
Estimated Replacement Costs:	Labor Costs:	Material Cost:
Comments:		

General Condition: **1** = Poor; **2** = Fair; **3** = Good.
System Tuneup/Replacement Status: **1** = Tuneup/Replacement Optional; **2** = Tuneup Already Performed; **3** = Tuneup Mandatory; **4** = Replacement Mandatory **5** = High Efficiency Replacement Mandatory
Estimated Replacement Costs: Enter Costs if Different From Default Value.

NEAT - SPACE HEATER/OTHER SYSTEMS

Manufacturer:		Model Number:
Input Units: (i.e. kBtu/h)	Input Rating:	Output Capacity:
Steady-State Efficiency: (%)	Vent Damper Present? (Y/N)	Vent Damper Recommended? **N**
Vent Damper Diameter (in.) **NA**	General Condition:	Tuneup/Replacement Status:
Estimated Replacement Costs:	Labor Costs:	Material Cost:
Repair/Replacement/Comments:		

Input Units: **0** = No Input; **1** = kBtu/hr.; **2** = gal/hr.;**3** = lb./hr.; **4** = ccm
General Condition: **1** = Poor; **2** = Fair; **3** = Good
System Tuneup/Replacement Status: **1** = Tuneup/Replacement Optional; **2** = Tuneup Already Performed; **3** = Tuneup Mandatory; **4** = Replacement Mandatory.

Additional Comments/Notes:

Job Number:_____

NEAT - PRIMARY FURNACE -BOILER, OIL FUELED		
Manufacturer:		Model Number:
Input Units: (i.e. kBtu/h)	Input Rating:	Output Capacity:
Steady-State Efficiency: (%)	Vent Damper Present? (Y/N)	Vent Damper Recommended? **N**
Vent Damper Diameter (in.) **NA**	Burner, (Flame) Retention Head Present? (Y/N)	Burner, Recommended? (Y/N)
Furnace General Condition:	Tuneup/Replacement Status:	
Estimated Replacement Costs:	Labor Costs:	Material Cost:
Comments:		

Input Units: **0** = No Input; **1** = kBtu/hr.; **2** = gal/hr.; **3** = lb./hr.; **4** = ccm
General Conditions: **1** = Poor; **2** = Fair; **3** = Good
System Tuneup/Replacement Status: **1** = Tuneup/Replacement Optional; **2** = Tuneup Already Performed; **3** = Tuneup Mandatory; **4** = Replacement Mandatory.
Estimated Replacement Costs: Enter Costs if Different From Default Value.

PRIMARY HEAT SOURCE		PRE-INSP.	CONTRACTOR	POST-INSP.
1. Is fuel available/furnace on?		Yes No NA	Yes No NA	Yes No NA
2. Adjust fuel supply to control valve.			Repaired NA	
3. Adjust burner and gas input.			Repaired NA	
4. Adjust the pilot light and/or adjust combustible blower (for power blower).			Repaired NA	
5. Check the pressure regulator.			Repaired NA Replaced NA	
6. Check Temperature rise/within range on rating?		Yes No NA	Yes No NA	Yes No NA
7. Filter present & in good condition?		Yes No NA		
8. Filter Size?		_____	Replaced NA	Yes No NA
9. Blower housing and motor needs cleaning?		Yes No NA	Done NA	Yes No NA
10. Combustion Chamber needs cleaning?		Yes No NA	Done NA	Yes No NA
11. Cabinet needs cleaning?		Yes No NA	Done NA	Yes No NA
12. Heat exchanger needs cleaning?		Yes No NA	Done NA	Yes No NA
13. Burner Ports and Fire Tubes need cleaning?		Yes No NA	Done NA	Yes No NA
14. Problems with fan/limit controls?		Yes No NA	Repaired NA Replaced NA	Yes No NA
15. Problem with Thermostat?		Yes No NA	Repaired NA Replaced NA	Yes No NA
16. Are tiles/glass missing, broken, or in need of repair?		Yes No NA	Repaired NA Replaced NA	Yes No NA
17. Belts need replacement/adjustments?		Yes No NA	Repaired NA Replaced NA	Yes No NA
18. Combustion/make-up air adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA
19. Heating duct work present/adequate?		Yes No NA	Repaired NA Replaced NA	Yes No
20. Return air duct work present/adequate?		Yes No NA	Repaired NA Replaced NA	Yes No NA

Job Number:_____

21. Net stack temperature (Flue gas temperature minus room temperature).	_____F	_____F	_____F
22. Flue gas content _____Oxygen (O2) or_____Carbon Dioxide (CO2)	_____%	_____%	_____%
23. Steady State Efficiency (after tune-up SSE within 5% of Manufacturer's AFUE or 70% required)	Yes No NA _____%	Yes No NA _____%	Yes No NA _____%
24. CO in flue gasses at top of heat exchanger (check each port) Maximum 100 PPM / 400 PPM acceptable at Start up. Port 1 Port 2 Port 3 Port 4 Port 5 Port 6	 _____PPM _____PPM _____PPM _____PPM _____PPM _____PPM	 _____PPM _____PPM _____PPM _____PPM _____PPM _____PPM	 _____PPM _____PPM _____PPM _____PPM _____PPM _____PPM
25. Properly operating limit control/automatic fuel safety shut off and/or Boiler controls.	Yes No NA	Replaced NA	Yes No NA
26. Actual Input (clock the meter) kBtu?			
27. Problems with Heat Exchanger? How Tested?		Yes No	
28. Venting system needs replacement or repair?	Yes No NA	Yes No NA	Yes No NA
29. **Oil information**: Oil filter present?	Yes No NA	Replaced NA	Yes No NA
30. Oil Filter needs cleaning?	Yes No NA	Done NA	Yes No NA
31. Nozzle Size?			
32. Combustion Chamber in good condition?	Yes No NA	Repair/Replace Yes No NA	Yes No NA
33. Smoke Reading?			
34. Oil Pump pressure set at 100psi or per Manufacturer's recommendations.		Repair/Replace Yes No NA	
35. Orifice replaced (if Necessary).		Done NA	Yes No NA

Note: Contractor must complete all entries including retesting when applicable. Comments:

FURNACE TUNE-UP COSTS* **(Justified by NEAT Audit)**		**Estimated Quantity**	**Estimated Cost ($)**	**Actual Quantity**	**Actual Cost ($)**
TOTAL FURNACE TUNE-UP COSTS (Justified by NEAT Audit):					

FURNACE REPLACEMENT COSTS*		**Estimated Quantity**	**Estimated Cost ($)**	**Actual Quantity**	**Actual Cost ($)**
TOTAL FURNACE REPLACEMENT COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

ADDITIONAL FURNACE COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL ADDITIONAL FURNACE COSTS:					

OIL FLAME RETENTION BURNER COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL OIL FLAME RETENTION BURNER COSTS					

REFRIGERATOR REPLACEMENT

Existing Manufacturer:	Model No.:	Manual Defrost: (**Y**) (**N**)	Includes Defrost Cycle: (**Y**) (**N**)
Height (inches):	Width (inches):	Depth (inches):	
Size (CF):	Location:	kWh/Yr:	Age:
Metering Minutes:	Meter Reading:		
Type of Audit: **NEAT (Y) (N), REDAT (Y) (N),**		Replacement Refrigerator **SIR**:	
Comments:			

Location: Heated Space, Unheated Space, Unintentionally Heated **Age**: **1** = Less than 5 Years, **2** = 5 to 10 Years, **3** = 10 to 15 Years, **4** = More Than 15 Years

Replacement Manufacturer:	Model No.:		
Height (inches):	Width (inches):	Depth (inches):	Size (CF):

REFRIGERATOR REPLACEMENT COSTS		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL REFRIGERATOR REPLACEMENT COSTS					

Job Number:_____

COMPACT FLOURESCENT LIGHT BULBS									
Light Code	Room	Location	Lamp Type	Quantity	Watts	Hours/ Day	CF Watts	Added Costs	Comment

Light Code: Agency Generated (i.e. **L1**, **L2**, **L3**, **L4**, etc.).
Room: **1** = Family Room, **2** = Kitchen, **3** = Living Room. **4** = Rec. **5** = Room, **6** = Dining, **7** = Bedroom, **8** = Utility, **9** = Other
Location: **1** = Ceiling, **2** = Floor, **3** = Table, **4** = Wall **Lamp Type**:**1** = Standard, **2** = Flood

COMPACT FLOURESCENT LIGHT BULB COSTS	Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL COMPACT FLOURESCENT LIGHT BULB COSTS				

ITEMIZED COSTS

Note: This Section only requires completion when a NEAT audit is to be done (WFM II.I.B.)

Item Description or User-defined Measure Name	Cost ($)	Incl.. in SIR	Materials Required	Energy Savings	Life	Fuel Saved
Health & Safety Costs		Y		NA	NA	NA
		Y		NA	NA	NA
Duct Insulation Costs		Y		NA	NA	NA
		Y		NA	NA	NA
Duct Seal./Rep./Repl. Costs		Y		NA	NA	NA
		Y		NA	NA	NA
Incidental Repair Costs		Y		NA	NA	NA
		Y		NA	NA	NA
Miscellaneous Costs		Y		NA	NA	NA
		Y		NA	NA	NA
Optional Wx Measures Costs		Y		NA	NA	NA
		Y		NA	NA	NA

Note: Specifics relative to the above "Itemized Additional Costs" categories to be entered on pages 17 and 18.

Job Number:_____

HEALTH AND SAFETY COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL HEALTH AND SAFETY COSTS:					

DUCT INSULATION COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL DUCT INSULATION COSTS:					

DUCT SEALING/REPAIR/REPLACEMENT COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL DUCT SEALING/REPAIR/REPLACEMENT COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

INCIDENTAL REPAIR COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL INCIDENTAL REPAIR COSTS:					

MISCELLANEOUS COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL MISCELLANEOUS COSTS:					

OPTIONAL WEATHERIZATION MEASURES COSTS*		Estimated Quantity	Estimated Cost ($)	Actual Quantity	Actual Cost ($)
TOTAL OPTIONAL WEATHERIZATION MEASURES COSTS:					

***All "Costs" entered on the Building Check and Job Order Sheet should include materials required, sizes, and locations (or reference attachment - i.e., drawing).**

Job Number:_____

TOTAL JOB COSTS **[ ] MAT [ ] LAB/MAT**	**Estimated Costs**	**Actual Costs**	**_____ Costs**	**_____ Costs**	**DOE Costs**	**Total Costs**
Major Bypass/Infiltration/Exfiltration Costs (page 4)						
Wall Insulation Costs (page 6)						
Additional Wall Insulation Costs (page 6)						
Storm Window Costs (page 7)						
Attic Insulation Costs (page 8)						
Additional Attic Insul and/or Ventilation costs (page 9)						
Foundation and/or Band Joist Insulation Costs (page 10)						
Added Foundation Insulation and/or Vent Costs (page 10)						
Furnace Tune-up Costs (Justified by NEAT Audit - page 15)						
Furnace Replacement Costs (page 15)						
Additional Furnace Costs (page 16)						
Oil Flame Retention Burner Costs (page 16)						
Refrigerator Replacement Costs (page 16)						
Compact Flourescent Light Bulb Costs (page 17)						
Health and Safety Costs (page 18)						
Duct Insulation Costs (page 18)						
Duct Sealing/Repair/Replacement Costs (page 18)						
Incidental Repair Costs (page 19)						
Miscellaneous Costs (page 19)						
Optional Weatherization Measures Costs (page 19)						
JOB COST TOTALS:						

LABOR COSTS BREAKDOWN	**Estimated Costs**	**Actual Costs**	**_____ Costs**	**_____ Costs**	**DOE Costs**	**Total Costs**
If Private Contractor used, Total Labor Cost						
If Crews, Total Labor Hours						

MULTI UNIT COST BREAKOUT

UNIT/ JOB NUMBER	**MATERIAL COSTS**	**CONTRACT LABOR**	**CREW LABOR $/HOURS**
Unit Number:_____	$	$	$ / Hours
Unit Number:_____	$	$	$ / Hours
Unit Number:_____	$	$	$ / Hours
Unit Number:_____	$	$	$ / Hours

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Client/Job File Requirements/Documentation	III	II	A.2
	Date Issued: January 1997		
Subject: Client/Job File Client Plan of Action	**Supersedes:**		
	Page 1		

2. CLIENT PLAN OF ACTION

Client energy education should be provided throughout the weatherization process (see CSPM 612.4, Client Energy Education). As a part of this process "energy saving tips" are discussed with the client, generally the preinspector provides this information.

If the client is agreeable a Client Plan of Action (see next page of this Section/Subject) is completed with the client agreement to try three Energy Action Steps (see last page of this Section/Subject). This document should be maintained in the client/job file and the Energy Action Steps discussed/reinforced during subsequent visits. If the client is not agreeable to completing a Client Plan of Action, this should be documented in the client/job file.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Client/Job File Requirements/Documentation	III	II	A.3
	Date Issued: January 1997		
Subject: Client/Job File Client Inspection/Assessment	**Supersedes:**		
	Page 1		

3. CLIENT INSPECTION/ASSESSMENT

Generally as a part of the postinspection a Client Inspection/Assessment for Weatherization (see next page of this section/subject) is completed and signed by the postinspector and client. The client is asked to complete an assessment of each of the Wx measures. The completed/signed form shall be maintained in the client/job file. If the client refuses to sign or for some other reason the form cannot be completed, the reason should be documented in the client/job file.

WEATHERIZATION PROGRAM
CLIENT
INSPECTION/ASSESSMENT
State of Michigan
Family Independence Agency

Weatherization Agency Name:		
Address (Street Number and Name):		
City:	State: Michigan	Zip Code:
Telephone Number: ( )		

Client Name:		Address of Home (Street Number and Name):	
City:	State: Michigan	Zip Code:	Job Number:

The services performed on your home were completed to the extent possible within the current available funding and program limitations. The services provided are free of charge. Please rate the performance of each task which was completed. Thank your for your cooperation.

	WEATHERIZATION MEASURE Check Work Performed	CLIENT ASSESSMENT Good	Fair	Poor		WEATHERIZATION MEASURE Check Work Performed	CLIENT ASSESSMENT Good	Fair	Poor
❒	Health and Safety	❒	❒	❒	❒	Band Joist Insulation	❒	❒	❒
❒	Major Bypasses	❒	❒	❒	❒	Floor Insulation	❒	❒	❒
❒	Duct Sealing/Repair/Replacement	❒	❒	❒	❒	Perimeter Insulation	❒	❒	❒
❒	Duct Insulation	❒	❒	❒	❒	Refrigerator Replacement	❒	❒	❒
❒	Furnace Filter	❒	❒	❒	❒	Other	❒	❒	❒
❒	Attic Insulation	❒	❒	❒	❒		❒	❒	❒
❒	Kneewall Insulation	❒	❒	❒	❒		❒	❒	❒
❒	Wall Insulation	❒	❒	❒	❒		❒	❒	❒
❒	Infiltration/Exfiltration	❒	❒	❒	❒		❒	❒	❒
❒	Compact Fluorescent Light Bulbs	❒	❒	❒	❒		❒	❒	❒

*Please note that not all the above measures are installed on every home. The local weatherization agency makes final installation decisions after their preinspection and after reviewing total job costs and program limitations.

I understand that representatives of the state and federal government have the responsibility to monitor the performance of the weatherization agency. This means that the work performed to my dwelling may be inspected by representatives of those organizations.

By signature, I certify that the weatherization tasks were completed in my home and I have rated the weatherization crew's work performance.

Client's Signature:	Date:
Inspector's Signature:	Date:

Additional Comments:

AUTHORITY: P.A. 230 OF 1981 COMPLETION: Required PENALTY: None	The Family Independence Agency will not discriminate against any individual or group because of race, sex, religion, age, national origin, color, martial status, political beliefs or disability.

FIA - 1008 (Rev. 11-02) Previous edition obsolete.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Client/Job File Requirements/Documentation	III	II	A.4
	Date Issued: January 1997		
Subject: Client/Job File Unit Completion Reference	**Supersedes:** December 1994		
	Page 1		

4. UNIT COMPLETION REFERENCE

No dwelling unit may be reported as completed until all weatherization materials have been installed and the LWO, or its authorized representative, has performed and approved a final inspection, including any mechanical work performed, and has certified that the work has been completed in a professional manner and in accordance with the required audit/Wx Field Manual requirements and that all required/applicable forms and documentation (see Subject B. of this Section) are completed and in the client/job file.

In cases in which weatherization work was started but cannot be completed for a justified reason, signed and dated documentation shall be provided in the client job file as to why the weatherization work was stopped and the unit may be considered a completion. Examples of reasons to stop weatherization work:

- Death of client.
- Dwelling is vacated and/or sold.
- Unable to contact client after numerous (documented) attempts.
- Extensive fire damage.
- Client refuses further weatherization work.
- Health and safety risks to contractor/crew (i.e. unsanitary conditions, drugs, threats, etc.).

Although one of the above may occur, if weatherization work can be continued, it should.

For example: If the client dies but other income eligible household members remain, the unit would be completed.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Client/Job File Requirements/Documentation	III	II	A.5
	Date Issued: November 2002		
Subject: Client/Job File NEAT File Documentation	**Supersedes:**		
	Page 1		

5. NEAT FILE DOCUMENTATION

The client/job files for units weatherized using NEAT audits shall include:

- NEAT Job Input Summary Report
- NEAT Output Summary Report

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Client/Job File Requirements/Documentation	III	II	B
	Date Issued: November 2002		
Subject: Client/Job File File Documentation Checklist	**Supersedes:** June 1999		
	Page 1		

B. FILE DOCUMENTATION CHECKLIST

All required forms and documentation shall be maintained in the client/job file. Prior to reporting weatherization units as completions, LWO shall verify that all required/appropriate forms and documentation are included in the client/job file.

The following page in this Subject is a Checklist for Client/Job File Documentation. The Checklist is an optional form which may be used as an aid to insure the completeness of client/job files.

WEATHERIZATION CHECKLIST FOR CLIENT/JOB FILE DOCUMENTATION

State of Michigan
Family Independence Agency

Job Number _____

Weatherization Agency Name		
Client Name		Zip Code
Address (Streeet Number and Name)		
City	State	Rep. Initials

I. CLIENT ELIGIBILITY (see CSPM for policies/forms)

Yes/NA		
☐ / ☐	1.	Client Application FIA-4283 (Rev. 4/99)
☐ / ☐	2.	Proof of Income
☐ / ☐	3.	Ownership or Landlord Agreement/Exhibits/Tenant Synopsis/ and Lease
☐ / ☐	4.	Priority Criteria Selection
☐ / ☐	5.	Notification of Eligibility/Ineligibility a. Notification of Job Scheduling b. Notification of Appeal Process

II. JOB-RELATED (see WFM for policies/forms)

Yes/NA		
☐ / ☐	1.	Building Check and Job Order Sheet (BCJO) FIA-4284M, FIA-4284P, or FIA-4284 (Rev. 11/02)
☐ / ☐	2.	Blower Door Test Data Sheet FIA-4287 (Rev. 11/02), BCJO - FIA-4284M, FIA-4284P, or FIA-4284 (Rev.11/02), or a completed “AT Risk Home Status Work Sheet”
☐ / ☐	3.	NEAT Job Input Summary Report/NEAT Output Summary Report (Recommended Measures List)
☐ / ☐	4.	Confirmation of Receipt of Lead Pamphlet FIA-4285
☐ / ☐	5.	Client Energy Plan of Action
☐ / ☐	6.	Asbestos Notification Letter FIA-4290 (Rev. 11/02)
☐ / ☐	7.	Notice of Indoor Air Quality Concern FIA-4289 (Rev. 11/02)
☐ / ☐	8.	Notice of Potentially Unsafe Condition FIA-4288 (Rev. 11/02)
☐ / ☐	9.	Certificate of Insulation
☐ / ☐	10.	Contractor’s Invoice
☐ / ☐	11.	Post-inspection Documentation/Corrections Approved
☐ / ☐	12.	Client Inspection/Assessment FIA-1008 (Rev. 11/02)
☐ / ☐	13.	Refrigerator Documentation
☐ / ☐	15.	Other:_____
☐ / ☐	16.	_____
☐ / ☐	17.	_____
☐ / ☐	18.	_____
☐ / ☐	19.	_____

Authority: PA 230 of 1981 Completion: Optional Penalty: None	The Family Independence Agency will not discriminate against any individual or group because of race, sex, religion, age, national origin, color, marital status, political beliefs or disability.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Standards for Weatherization Materials	III	III	
	Date Issued: January 1997		
Subject: Standards for Weatherization Materials	**Supersedes:** June 1994		
	Page 1		

STANDARDS FOR WEATHERIZATION MATERIALS

Standards for weatherization materials and materials documentation requirements are contained in this section.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Standards for Weatherization Materials	III	III	A
	Date Issued: January 1997		
Subject: Weatherization Materials Materials Standards	**Supersedes:** June 1994		
	Page 1		

A. MATERIALS STANDARDS

Weatherization materials standards and insulation requirements are contained in this Section/Subject.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Standards for Weatherization Materials	III	III	A.1
	Date Issued: November 2002		
Subject: Weatherization Materials Minimum Standards	**Supersedes:** January 1997		
	Page 1		

1. MINIMUM STANDARDS FOR WEATHERIZATION MATERIALS

The attached Department of Energy Weatherization Assistance Program (DOE/ WAP) For Low-Income Persons, 10 CFR Part 440 Final Rule dated February 1, 2002, Appendix A-Standards for Weatherization Materials from paragraph 440.21 - Weatherization Materials Standards and Energy Audit Procedures, lists all allowable weatherization materials and contains the minimum standards and testing requirements for weatherization materials.

In cases where Michigan Weatherization Program standards are more restrictive, such requirements will be enforced. For example:

> In addition to Appendix A requirements, the Michigan Weatherization Program ten-year life requirement for weatherization materials will be enforced.

Materials listed in Appendix A which are not included in the allowable NEAT Candidate Conservation Measures (see Chapter II, Section I.B.) are not allowable unless specifically authorized by the state weatherization office.

APPENDIX A—STANDARDS FOR WEATHERIZATION MATERIALS

If the standards listed in this appendix conflict with those required by current local codes, the local code shall have precedence and a copy of the applicable section will be retained with procurement records.

The following Government standards are produced by the Consumer Product Safety Commission and are published in title 16, Code of Federal Regulations:

Thermal Insulating Materials for Building Elements Including Walls, Floors, Ceilings, Attics, and Roofs Insulation—organic fiber—conformance to Interim Safety Standard in 16 CFR part 1209;

Fire Safety Requirements for Thermal Insulating Materials According to Insulation Use—Attic Floor—insulation materials intended for exposed use in attic floors shall be capable of meeting the same flammability requirements given for cellulose insulation in 16 CFR part 1209;

Enclosed spaces—insulation materials intended for use within enclosed stud or joist spaces shall be capable of meeting smoldering combustion requirements in 16 CFR part 1209.

The following standards which are not otherwise set forth in part 440 are incorporated by reference and made part of part 440. The following standards have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. These materials are incorporated as they exist on January 3, 2002 and a notice of any change in these materials will be published in the FEDERAL REGISTER. The standards incorporated by reference are available for inspection at the Office of the Federal Register Information Center, 800 North Capitol Street, Suite 700, Washington, DC 20001.

The standards incorporated by reference in part 440 can be obtained from the following sources:

Air Conditioning and Refrigeration Institute, 4301 N. Fairfax Drive, Suite 425, Arlington, VA 22203; (703) 524-8800.

American Architectural Manufacturers Association, 1827 Walden Office Square, Suite 104, Schaumburg, Illinois 60173-4268; (847) 303-5664.

American Gas Association, 400 N. Capitol Street, NW, Washington, DC 20001; (202) 824-7000.

American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036; (212) 642-4900.

American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990; (212) 591-7722.

American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959; (610) 832-9585.

Association of Home Appliance Manufacturers, 1111 19th Street, NW, Suite 402, Washington DC, 20036; (202) 872-5955.

Federal Specifications, General Services Administration, General Services Administration, Federal Supply Service, Office of the CIO and Marketing Division, Room 800, 1941 Jefferson Davis Hwy., Arlington, VA 22202; (703) 305-6288.

Gas Appliance Manufacturers Association, 2107 Wilson Boulevard, Suite 600, Arlington, Virginia 22201; (703) 525-7060.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209; (703) 841-3200.

National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; (617) 770-3000.

Sheet Metal and Air Conditioning Contractors Association, 4201 Lafayette Center Drive, Chantilly, Virginia 20151-1209; (703) 803-2980.

Solar Rating and Certification Corporation, c/o FSEC, 1679 Clearlake Road, Cocoa, FL 32922-5703; (321) 638-1537.

Steel Door Institute, 30200 Detroit Road, Cleveland, OH 44145-1967; (440) 899-0010.

Steel Window Institute, 1300 Sumner Avenue, Cleveland, OH 44115-2851; (216) 241-7333.

Tubular Exchanger Manufacturers Association, 25 North Broadway, Tarrytown, NY 10591; (914) 322-0040.

Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096; (847) 272-8800.

Window & Door Manufacturers Association, 1400 East Touhy Avenue, Suite 470, Des Plaines, IL 60018; (800) 223-2301.

More information regarding the standards in this reference can be obtained from the following sources:

Environmental Protection Agency, 401 M Street, NW, Washington, DC 20006; (202) 554-1080.

National Institute of Standards and Technology, U.S. Department of Commerce, Gaithersburg, MD 20899; (301) 975-2000.

Weatherization Assistance Program, Office of Building Technology Assistance, Energy Efficiency and Renewable Energy, 1000 Independence Avenue, SW, EE-42, Washington, DC 20585-0121; (202) 586-4074.

THERMAL INSULATING MATERIALS FOR BUILDING ELEMENTS INCLUDING WALLS, FLOORS, CEILINGS, ATTICS, AND ROOFS

[Standards for conformance]

Insulation--mineral fiber:	
Blanket insulation	ASTM[1] C665-98.
Roof insulation board	ASTM C726-00a.
Loose-fill insulation	ASTM C764-99.
Insulation--mineral cellular:	
Vermiculite loose-fill insulation	ASTM C516-80 (1996)e1.
Perlite loose-fill insulation .	ASTM C549-81 (1995)e1.
Cellular glass insulation block	ASTM C552-00.
Perlite insulation board . . .	ASTM C728-97.
Insulation–organic fiber:	
Cellulosic fiber insulating board	ASTM C208-95.
Cellulose loose-fill insulation	ASTM C739-00.
Cellulose wet-spray insulation	ASTM C1149-97.
Insulation–organic cellular:	
Preformed block-type polystyrene insulation	ASTM C578-95.
Rigid preformed polyurethane insulation board	ASTM C591-00.
Polyurethane or polyisocyanurate insulation board face with aluminum foil on both sides	FS[2] HH-I-1972/1 (1981).
Polyurethane or polyisocyanurate insulation board face with felt on both sides	FS HH-I-1972/2 (1981) and Amendment 1, October 3, 1985).
Insulation–composite boards:	
Mineral fiber insulation board	ASTM C726-00a.
Perlite board	ASTM C728-97.
Gypsum board and polyurethane or poliso-cyanurate composite board	FS HH-I-1972/4 (1981).

[1] ASTM indicates American Society for Testing and Materials.

[2] FS indicates Federal Specifications.

THERMAL INSULATING MATERIALS FOR BUILDING ELEMENTS INCLUDING WALLS, FLOORS, CEILINGS, ATTICS, AND ROOFS–Continued

[Standards for conformance]

Materials used as a patch to reduce infiltration through the building envelope	Commercially available.

THERMAL INSULATING MATERIALS FOR PIPES, DUCTS, AND EQUIPMENT SUCH AS BOILERS AND FURNACES

[Standards for conformance]

Insulation–mineral fiber:	
Preformed pipe insulation .	ASTM[1] C547-00.
Blanket and felt insulation (industrial type)	ASTM C553-00.
Blanket insulation and blanket type pipe insulation (metal-mesh covered, industrial type)	ASTM C592-00.
Block and board insulation	ASTM C612-00.
Spray applied mineral fiber thermal and sound absorbing insulation	ASTM C1014-99ae1.
High-temperature fiber blanket insulation	ASTM C892-00.
Duct work insulation	ASTM C1290-00.
Insulation–mineral cellular:	
Calcium silicate block and pipe insulation	ASTM C533-95.
Cellular glass insulation . .	ASTM C552-00.
Expanded perlite block and pipe insulation	ASTM C610-99.
Insulation–organic cellular:	
Preformed flexible elastomeric cellular insulation in sheet and tubular form	ASTM C534-99.
Unfaced preformed rigid cellular polyurethane insulation	ASTM C591-00.
Insulation skirting	Commercially available.

[1] ASTM indicates American Society for Testing and Materials.

FIRE SAFETY REQUIREMENTS FOR INSULATING MATERIALS ACCORDING TO INSULATION USE

[Standards for conformance]

Attic floor	Insulation materials intended for exposed use in attic floors shall be capable of meeting the same smoldering combustion requirements given for cellulose insulation in ASTM[1] C739-00.
Enclosed space	Insulation materials intended for use within enclosed stud or joist spaces shall be capable of meeting the same smoldering combustion requirements given for cellulose insulation in ASTM C739-00.
Exposed interior walls and ceilings	Insulation materials, including those with combustible facings, which remain exposed and serve as wall or ceiling interior finish, shall have a flame spread classification not to exceed 150 (per ASTM E84-00a).
Exterior envelope walls and roofs	Exterior envelope walls and roofs containing thermal insulation shall meet applicable local government building code requirements for the complete wall or roof assembly.
Pipes, ducts, and equipment	Insulation materials intended for use on pipes, ducts, and equipment shall be capable of meeting a flame spread classification not to exceed 150 (per ASTM E84-00a).

[1] ASTM indicates American Society for Testing and Materials.

STORM WINDOWS

[Standards for conformance]

Storm windows:	
All storm windows . .	AAMA/NWWDA[1] 101/I.S. 2-97.
Aluminum frame storm windows	AAMA[2] 1002.10-93.
Rigid vinyl frame storm windows	ASTM[3] D4726-00.
Frameless plastic glazing storm	Required minimum thickness for windows is 6 mil (0.006 inches).
Movable insulation systems for windows	Commercially available.

[1] AAMA/NWWDA indicates American Architectural Manufacturers Association/National Wood Window & Door Association (now the Window & Door Manufacturers Association).

[2] AAMA indicates American Architectural Manufacturers Association.

[3] ASTM indicates American Society for Testing and Materials.

REPLACEMENT WINDOWS

[Standards for conformance]

Replacement windows:	
All windows	AAMA/NWWDA[1] 101/I.S. 2-97.
Steel frame windows	Steel Window Institute recommended specifications for steel windows, 1990.
Rigid vinyl frame windows	ASTM[2] D4726-00.

[1] AAMA/NWWDA indicates American Architectural Manufacturers Association/National Wood Window & Door Association (now the Window & Door Manufacturers Association).

[2] ASTM indicates American Society for Testing and Materials.

STORM DOORS

[Standards for conformance]

Storm doors:	
All storm (glass) doors	AAMA/NWWDA[1] 101/I.S. 2-97.
Aluminum frame storm doors	AAMA[2] 1102.7-89.
Sliding glass storm doors	AAMA 1002.10-93.
Rigid vinyl storm doors .	ASTM[3] D3678-97 and D4726-00..
Vestibules:	
Materials to construct vestibules	Commercially available.

[1] AAMA/NWWDA indicates American Architectural Manufacturers Association/National Wood Window & Door Association (now the Window & Door Manufacturers Association).

[2] AAMA indicates American Architectural Manufacturers Association.

[3] ASTM indicates American Society for Testing and Materials.

REPLACEMENT DOORS

[Standards for conformance]

Replacement doors:	
All replacement doors	AAMA/NWWDA[1] 101/I.S. 2-97.
Steel doors	ANSI[2] A250.8-98.
Wood doors:	
Flush doors	ANSI/NWWDA[3] I.S. 1-97 (Amendment, exterior door provisions).
Stile and rail doors	NWWDA[4] I.S. 6-97.

[1] AAMA/NWWDA indicates American Architectural Manufacturers Association/National Wood Window & Door Association (now the Window & Door Manufacturers Association).

[2] ANSI indicates American National Standards Institute.

[3] ANSI/NWWDA indicates American National Standards Institute/National Wood Window & Door Association (now the Window & Door Manufacturers Association).

[4] NWWDA indicates National Wood Window & Door Association (now the Window & Door Manufacturers Association).

CAULKS AND SEALANTS

[Standards for conformance]

Caulks and sealants:	
Glazing compounds for metal sash	ASTM[1] C669-00.
Oil and resin base caulks	ASTM C570-00.
Acrylic (solvent types) sealants	ASTM C920-98e1.
Butyl rubber sealants	FS[2] Commercial Item Description A-A-272 (6/7/95).
Chlorosulfonated polyethylene sealants	ASTM C920-98e1.
Latex sealing compounds	ASTM C834-00e1.
Elastomeric joint sealants (normally considered to include polysulfide, polyurethane, and silicone)	ASTM C920-98e1.
Preformed gaskets and sealing materials	ASTM C509-00.
Duct sealing mastic	UL[3] 181A-M, Second Edition, 1994 and UL 181B-M, First Edition, 1995.

[1] ASTM indicates American Society for Testing and Materials.

[2] FS indicates Federal Specifications.

[3] UL indicates Underwriters Laboratories.

WEATHERSTRIPPING

[Standards for conformance]

Weatherstripping	Commercially available.
Vapor retarders	Selected according to the provisions cited in ASTM[1] C755-97. Permeance not greater than 1 perm when determined according to the desiccant method described in ASTM E96-00.
Items to improve attic ventilation	Commercially available.

[1] ASTM indicates American Society for Testing and Materials.

HEAT EXCHANGERS

[Standards for conformance]

Heat exchangers, water-to-water and steam-to-water	ASME[1] Boiler and Pressure Vessel Code, 1998, Sections II, V, VIII, IX, and X, as applicable to pressure vessels. Standards of Tubular Exchanger Manufacturers Association, Eighth Edition, 1999.
Heat exchangers with gas-fired appliances[2]	ANSI/UL[3] 462, Ninth Edition, approved by ANSI February 28, 1997.

[1] ASME indicates American Society for Mechanical Engineers.

[2] The heat reclaimer is for installation in a section of the vent connector from appliances equipped with draft hoods or appliances equipped with powered burners or induced draft and not equipped with a draft hood.

[3] ANSI/UL indicates American National Standards Institute/Underwriters Laboratories.

BOILER/FURNACE CONTROL SYSTEMS

[Standards for conformance]

Automatic set back thermostats	Listed by UL[1]. Conformance to NEMA[2] DC3-1989 (R1996).
Line voltage or low voltage room thermostats	Listed by UL. Conformance to NEMA DC3-1989 (R1996).
Clock thermostats	Listed by UL. Conformance to NEMA DC3-1989 (R1996).
Automatic gas ignition systems	ANSI[3] Z21.21-2000. AGA[4] Laboratories Certification Seal.
Energy management systems	Listed by UL.
Hydronic boiler controls	Listed by UL.
Other burner controls . .	Listed by UL.

[1] UL indicates Underwriters Laboratories.

[2] NEMA indicates National Electrical Manufacturers Association.

[3] ANSI indicates American National Standards Institute.

[4] AGA indicates American Gas Association.

WATER HEATER MODIFICATIONS

[Standards for conformance]

Insulate tank and distribution piping	(See insulation section of this appendix)
Install heat traps on inlet and outlet piping	Applicable local plumbing code.
Install/replace water heater heating elements	Listed by UL[1].
Electric, freeze-prevention tape for pipes	Listed by UL.
Install stack damper, gas-fueled	ANSI[2] Z21.66-1996, including Exhibits A & B, and ANSI Z223.1-1999 (same as NFPA[3] 54-1999).
Install stack damper, oil-fueled	UL 17, Third Edition, 1994, NFPA 31-2001, NFPA 211-2000 (same as ANSI A52.1), and ANSI/NFPA 70-1999 (same as IEEE[4] National Electrical Code).
Install water flow modifiers	Commercially available.

[1] UL indicates Underwriters Laboratories.
[2] ANSI indicates American National Standards Institute.
[3] NFPA indicates National Fire Prevention Association.
[4] IEEE indicates Institute of Electrical and Electronics Engineers.

REPLACEMENT WATER HEATERS

[Standards for conformance]

Electric (resistance) water heaters	10 CFR[1] 430 and UL[3] 174.
Heat pump water heaters	UL 1995, Second Edition, 1995. Electrical components to be listed by UL.
Gas water heaters:	
Rated ≤75 kBtu/hr . .	10 CFR 430 and ANSI[4] Z21.10.1-1998.
Rated ≥75 kBtu/hr . .	ANSI Z21.10.3-1998.
Oil water heaters	UL 732, Fifth Edition, 1995.

[1] CFR indicates Code of Federal Regulations.
[2] UL indicates Underwriters Laboratories.
[3] ANSI indicates American National Standards Institute.

SOLAR WATER HEATING SYSTEMS

[Standards for conformance]

Solar water heating systems including forced circulation, integral collector storage, thermo-syphon, and self-pumping systems	System must be certified per SRCC[1] OG 300, July 16, 1998.

[1] SRCC indicates Solar Rating and Certification Corporation.

WASTE HEAT RECOVERY DEVICES

[Standards for conformance]

Desuperheater/water heaters	ARI[1] 470-1995 and UL 1995, Second Edition, 1995.
Condensing heat exchangers	Commercially available components installed per manufacturers' specifications. NFPA[2] 211-2000 (same as ANSI A52.1) may apply in certain instances. See also the Heat Exchangers section of this appendix.
Heat pump water heating heat recovery systems	UL 1995, Second Edition, 1995. Electrical components to be listed by UL.
Energy recovery equipment	Energy Systems Analysis and Management, 1997 (SMACNA[3]).

[1] ARI indicates Air Conditioning and Refrigeration Institute.
[2] NFPA indicates National Fire Prevention Association.
[3] SMACNA denotes Sheet Metal and Air Conditioning Contractors' National Association.

BOILER REPAIR AND

Install gas conversation burners	ANSI[1] Z21.8-1994 (for gas- or oil-fired systems), ANSI Z21.17-1998, and ANSI Z223.1-1999 (same as NFPA 54-1999). AGA[2] Laboratories Certification Seal.
Replace oil burner	UL[3] 296, Ninth Edition, 1994 and NFPA 31-2001.
Install burners (oil/gas)	ANSI Z223.1-1999 for gas equipment and NFPA[4] 31-2001 for oil equipment.
Re-adjust boiler water temperature or install automatic boiler temperature reset control	ASME[5] CSD-1-1998, ANSI Z223.1-1999, and NFPA 31-2001.
Replace/modify boilers	ASME Boiler and Pressure Vessel Code, 1998, Section II, IV, V, VI, VIII, IX, and X. Boilers must be Hydronics Institute Division of GAMA equipment.
Clean heat exchanger, adjust burner air shutter(s), check smoke no. on oil-fueled equipment. Check operation of pump(s) and replacement filters.	Per manufacturers' instructions.
Replace combustion chambers	Refractory linings may be required for conversions.

BOILER REPAIR AND MODIFICATIONS/EFFICIENCY IMPROVEMENTS—Continued

[Standards for conformance]

Replace heat exchangers, tubes	Protection from flame contact with conversion burners by refractory shield.
Install/replace thermostatic radiator valves	Commercially available. One-pipe steam systems require air vents on each radiator; see manufacturers' requirements.
Install boiler duty cycle control system	Commercially available. ANSI/NFPA 70-1999 (same as IEEE National Electrical Code) and local electrical code provisions for wiring.

[1] ANSI indicates American National Standards Institute.
[2] AGA indicates American Gas Association.
[3] UL indicates Underwriters Laboratories.
[4] NFPA indicates National Fire Prevention Association.
[5] ASME indicates American Society for Mechanical Engineers.

HEATING AND COOLING SYSTEM REPAIRS AND TUNE-UPS/EFFICIENCY IMPROVEMENTS

[Standards for conformance]

Install duct insulation . .	ASTM[1] C612-00 (see insulation sections of this appendix).
Reduce Input of burner; derate gas-fueled equipment	Local utility company and procedures if applicable for gas-fueled furnaces and ANSI[2] Z223.1-1999 (same as NFPA[3] 54-1999) including Appendix H.
Repair/replace oil-fired equipment	NFPA 31-2001.
Replace combustion chamber in oil-fired furnaces or boilers	NFPA 31-2001.
Clean heat exchanger and adjust burner; adjust air shutter and check CO_2 and stack temperature. Clean or replace air filter on forced air furnace	ANSI Z223.1-1999 (same as NFPA 54-1999) including Appendix H.
Install vent dampers for gas-fueled heating systems	Applicable sections of ANSI Z223.1-1999 (same as NFPA 54-1999) including Appendix H, I, J, and K. ANSI Z21.66-1996 and Exhibits A&B for electrically operated dampers.
Install vent dampers for oil-fueled heating systems	Applicable sections of NFPA 31-2001 for installation and in conformance with UL[4] 17, Third Edition, 1994.

HEATING AND COOLING SYSTEM REPAIRS AND TUNE-UPS/EFFICIENCY IMPROVEMENTS—Continued

[Standards for conformance]

Reduce excess combustion air: A: Reduce vent connector size of gas-fueled appliances B: Adjust barometric draft regulator for oil fuels	ANSI Z223.1-1999 (same as NFPA 54-1999) part 9 and Appendices G & H. NFPA 31-2001 and per furnace and boiler manufacturers' instructions.
Replace constant burning pilot with electric ignition device on gas-fueled furnaces or boilers	ANSI Z21.71-1993.
Readjust fan switch on forced air gas-or oil-fueled furnaces	Applicable sections and Appendix H of ANSI Z223.1-1999 (same as NFPA 54-1999) for gas furnaces and NFPA 31-2001 for oil furnaces.
Replace burners	See install burners (oil/gas).
Install/replace duct furnaces (gas)	ANSI Z223.1-1999 (same as NFPA 54-1999).
Install/replace heat pumps	ARI[5] 210/240-1994. UL 1995, Second Edition, 1995.
Replace air diffusers, intakes, registers, and grilles	Commercially available.
Install/replace warm air heating metal ducts	UL 181, Ninth Edition 1996, including UL 181A, Second Edition 1994 and 181B, First Edition, 1995.
Filter alarm units	Commercially available.

[1] ASTM indicates American Society for Testing and Materials.

[2] ANSI indicates American National Standards Institute.

[3] NFPA indicates National Fire Prevention Association.

[4] UL indicates Underwriters Laboratories.

[5] ARI indicates Air Conditioning and Refrigeration Institute.

Replacement Furnaces, Boilers, and Wood Stoves

[Standards for conformance]

Chimneys, fireplaces, vents and solid fuel burning appliances	NFPA[1] 211-2000 (same as ANSI[2] A52.1).
Gas-fired furnaces	ANSI Z21.47-1998 and ANSI Z223.1-1999 (same as NFPA 54-1999).
Oil-fired furnaces	UL[3] 727, Eighth Edition, 1994 and NFPA 31-2001.
Liquefied petroleum gas storage	NFPA 58-2001.
Ventilation fans:	
Including electric attic, ceiling, and whole-house fans	UL 507, Ninth Edition, 1999.

[1] NFPA indicates National Fire Prevention Association.
[2] ANSI indicates American National Standards Institute.
[3] UL indicates Underwriters Laboratories.

Air Conditioners and Cooling Equipment

[Standards for conformance]

Air conditioners:	
Central air conditioners	ARI[1] 210/240-1994.
Room size units	ANSI/AHAM[2] RAC 1-1992.
Other cooling equipment:	
Including evaporative coolers, heat pumps, and other equipment	UL[3] 1995, Second Edition, 1995.

[1] ARI indicates Air Conditioning and Refrigeration Institute.
[2] ANSI/AHAM indicates American National Standards Institute/Association of Home Appliance Manufacturers.
[3] UL indicates Underwriters Laboratories.

Screens, Window Films, and Reflective Materials

[Standards for conformance]

Insect screens	Commercially available.
Window films	Commercially available.
Shade screens:	
Fiberglass shade screens	Commercially available.
Polyester shade screens	Commercially available.
Rigid awnings:	
Wood rigid awnings	Commercially available.
Metal rigid awnings .	Commercially available.
Louver systems:	
Wood louver awnings	Commercially available.
Metal louver awnings	Commercially available.
Industrial-grade white paint used as a heat-reflective measure on roofs, awnings, window louvers, doors, and exterior duct work (exposed)	Commercially available.

Refrigerators

[Standards for conformance]

Refrigerator/freezers (does not include freezer-only units)	UL[1] 250. Replaced units must be disposed of properly per Clean Air Act 1990, Section 608, as amended by 40 CFR[2] 82, May 14, 1993.

[1] UL indicates Underwriters Laboratories.
[2] CFR indicates Code of Federal Regulations.

Fluorescent Lamps and Fixtures

[Standards for conformance]

Compact fluorescent lamps	ANSI/UL[1] 542, Seventh Edition, February 6, 1997 and UL 1993, First Edition, 1993.
Fluorescent lighting fixtures	UL 1570, Fourth Edition, 1995.

[1] ANSI/UL indicates American National Standards Institute/Underwriters Laboratories.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Standards for Weatherization Materials	III	III	A.2
	Date Issued: June 1999		
Subject: Weatherization Materials Insulation Requirements	**Supersedes:** January 1997		
	Page 1		

2. INSULATION REQUIREMENTS

CERTIFICATE OF INSULATION

Whenever an area is addressed/completed with thermal insulation (attic, wall, perimeter, or floor insulation), contractors/crews are required to complete in triplicate a Certificate of Insulation form. This form shall contain the following information:

- Address of the building insulated;
- Date of completion of the installation;
- Name and address of the installer;
- Insulation type;
- Insulation manufacturer;
- When cellulose insulation is used, information from the bag specifying plant, batch number, date, and/or any other information needed to identify the batch;
- Location and dimension (in square feet) of each space which is insulated;
- The amount of insulation which was installed in each of the locations, given in the units in which the material is most commonly available;
- The R-value installed in each of the identified locations; and
- A statement signed by an authorized individual, certifying that the installation was carried out in conformance to the applicable standard practices, codes, and regulations.

One copy of this form goes to the householder; another is permanently affixed to the house in an accessible, but inconspicuous, place (i.e., if the attic is insulated above the attic access, if not by the water heater or electric service panel); and the third copy goes to the agency client/job file. Whenever cellulose insulation is utilized, an empty cellulose bag shall be posted at the house with the Certificate of Insulation. If more than one type of cellulose is used, an empty bag for each type used shall be posted.

CELLULOSE TESTING/LABELING REQUIREMENTS

In addition to the manufacturer's testing of cellulose insulation, it is required that all cellulose insulation used in the weatherization program be approved by an independent third-party testing lab and bear a test lab label.

Each bag of insulation purchased for use in the weatherization program must be labeled with the "full" label of the third-party test lab stating that the product is in conformance with the current standard for cellulose from Subject A.1., Minimum Standards for Wx Materials, in this section and listing the test results for:

a. Critical Radiant Flux
b. Smoldering Combustion
c. Corrosiveness
d. Fungi Resistance
e. Settled Density
f. Thermal Resistance
g. Moisture Absorption
h. Odor Emission
i. Starch Content

In addition, each bag must bear a legible batch number permanently marked by the manufacturer (hand written identification numbers are not acceptable) and ASTM number stating compliance with the current standard for cellulose from, Subject A.1., Minimum Standards for Wx Materials. Costs may be disallowed in cases where these requirements are not met.

Each local agency must obtain and maintain an up-to-date copy of the contract between the testing lab and the manufacturer and a current (within the last 12 months) third party test lab inspection report for each brand being utilized. Only those labs whose contracts call for a minimum of four on-site, no-notice tests per year will be acceptable.

The above-listed conditions must be satisfactorily met prior to the purchase and use of cellulose insulation.

Wet-Spray Cellulose Insulation

The application of wet-spray cellulose insulation is allowable. The application must comply with ASTM-C1149-90 and the manufacturer's instructions on the mixture and application of this product.

CELLULOSE MANUFACTURERS/BRANDS WITH APPROVED THIRD-PARTY TESTING

The following manufacturers/brands have been reviewed by the state weatherization office for compliance with the above cellulose insulation third-party testing requirements and were found to be in conformance:

Manufacturer	Brands
Applegate Insulation Mfg., Inc. 1000 Highview Drive Webberville, MI 48892	Applegate Stabilized Cellulose
Champion Insulation Inc. P.O. Box 320 Lomira, Wisconsin 53048	Weather Blanket House Blanket Comfort Control Wickes
Energy Control, Inc. 804 West Mill Street Ossian, Indiana 46777	ECI-II Forest Wool Double Pack Climate Control Wickes Lumber Momper Insulation Forest Wool
Greenstone a Louisiana-Pacific Corp. P.O.Box 1533 East Highway 24 Norfork, NE 68702	Nature Guard Cocoon Insulation Do-It Do-It Best Earth Wise Greenstone R-Pro R-Pro Plus Goodnews
Modern Insulation Inc. P.O. Box 157 Spencer, Wisconsin 54479	Weather Blanket
NuWool Company Inc. 2472 Port Sheldon Street Jenison, Michigan 48428	Energy Care NuWool Insulation ERB Lumber ATI
Regal Industries, Inc. 9564 East County Road, 600 South Crothersville, Indiana 47229	Professional Professional Brand IV Do-It Best Coverage Buster Gold Coverage Buster Blue Max Pack
US Fiber, Inc	Total Comfort Insulation Plus Pro Pack

Note: Agencies will not be required to obtain testing documentation relative to the above-listed manufacturers/brands. It should be noted that some manufacturers produce both test lab labeled and unlabeled products; brands not listed above will require complete documentation (as stated above).

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Standards for Weatherization Materials	III	III	B
	Date Issued: January 1997		
Subject: Weatherization Materials Documentation Requirements	**Supersedes:** November 1994		
	Page 1		

B. WEATHERIZATION MATERIALS DOCUMENTATION REQUIREMENTS

Agencies shall be responsible for compliance of all products used in weatherization with the required standards contained in the Weatherization Field Manual (including DOE/WAP Appendix A—Standards for Weatherization Materials contained in this section).

Documentation shall be maintained at the agency which establishes compliance with standards and testing requirements. Types of documentation may include manufacturer's specifications, material containers, and/or test lab reports. In cases where contractors are providing materials, the agency shall maintain documentation on all products being used by each contractor. Product documentation shall be organized in one location and available for monitoring review.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Certification/Training Requirements	III	IV	
	Date Issued: November 2002		
Subject: Certification/Training Requirements	**Supersedes:** January 1997		
	Page 1		

TRAINING/CERTIFICATION REQUIREMENTS

Training/certification requirements relative to blower door, pre-inspector/post-inspector, infrared wall scanner, and lead safe work practices are contained in this section.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Certification/Training Requirements	III	IV	A
	Date Issued: January 1997		
Subject: Certification/Training Blower Door Training	**Supersedes:** June 1994		
	Page 1		

A. BLOWER DOOR TRAINING

Each LWO shall have at least one person available who is trained and capable of properly completing blower door testing and related calculations. It is recommended that all LWO inspectors have the ability to perform these functions.

Chapter: Program Requirements	**Chapter**	**Section**	**Subject**
Section: Training/Certification Requirements	III	IV	B
	Date Issued: November 2002		
Subject: Training/Certification Wx Inspector Training/Certification	**Supersedes:** June 1999		
	Page 1		

B. WEATHERIZATION INSPECTOR TRAINING/CERTIFICATION

Weatherization inspector training/testing will be offered quarterly (4-days training/testing) at the Weatherization Training Center in Lansing. New inspectors must attend one of these training sessions within the first six months of assuming such positions.

On-the-job training is recommended for new inspectors prior to attending the training. New inspectors should receive on-the-job training from certified inspectors in all aspects of preinspection, postinspection, testing, and job documentation.

Those who qualify for certification by passing the required testing and satisfactorily completing on-the-job training subsequent to the testing will be issued a certificate. Documentation relative to inspector certification shall be maintained at the agency.

The State Weatherization Office may offer special testing relative to inspector certification as deemed appropriate. The State Weatherization Office also reserves the right to withdraw inspector certification at any time.

Each LWO must have at least one person certified to complete weatherization inspections. New inspectors and/or conditionally certified inspectors must complete inspections under the supervision/review of a certified inspector.

The State Weatherization Office may establish additional training/testing requirements as needed.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Training/Certification	III	IV	C
	Date Issued: June 1999		
Subject: Training Infrared Scanner Training	**Supersedes:**		
	Page 1		

C. INFRARED SCANNER TRAINING

Infrared Scanner orientation training will be offered on an as needed basis. Those attending this training will be authorized to use the State Weatherization Office infrared cameras. Individuals who have not attended one of these trainings will not be permitted to utilize this equipment.

Chapter: Technical Requirements	**Chapter**	**Section**	**Subject**
Section: Training/Certification	III	IV	D
	Date Issued: November 2002		
Subject: Training Lead Safe Work Practices Training	**Supersedes:**		
	Page 1		

D. LEAD SAFE WORK PRACTICES TRAINING

Lead Safe Work Practices orientation training will be offered on an as needed basis. Those attending this training will be authorized to inspect, supervise, and/or work on the homes as specified in Michigan's weatherization program. Individuals who have not attended one of these trainings will not be permitted to inspect, supervise, and/or work on the homes to be weatherized.

MICHIGAN WEATHERIZATION PROGRAM
WEATHERIZATION FIELD MANUAL
ACRONYMS/ABBREVIATIONS

ACH - Air Changes per Hour

BC&JOS- Building Check and Job Order Sheet (pre 11/02 date issued)

BCJO - Building Check and Job Order Sheet (11/02)

BTU - British Thermal Unit

CAA - Community Action Agency

CAZ Combustion Appliance Zone

CFM - Cubic Feet Per Minute

Cvg. - Covering

CO - Carbon Monoxide

CO2 - Carbon Dioxide

CSPM - Community Services Policy Manual

DOE - United States Department of Energy

F - Fahrenheit

FIA - Family Independence Agency

H&S - Health and Safety

IAQ - Indoor Air Quality

IID - Intermittent Ignition Device

k - 1000

K&T - Knob and Tube Wiring

LAB - Labor

LWO - Local Weatherization Operator

MAT - Material

MAX - Maximum

MIN - Minimum

N - No

NA - Not Applicable

NEAT - National Energy Audit Tool

o.c. - On Center

O2 - Oxygen

Pa - Pascals

PATH Partnership for Advanced Technology in Housing

PPM - Parts Per Million

PSI - Pounds Per Square Inch

R - Thermal Resistance

Req'd- Required

SIR - Savings to Investment Ratio

WAP - Weatherization Assistance Program

Wdw. - Window

WFM - Weatherization Field Manual

Wx - Weatherization

Y - Yes